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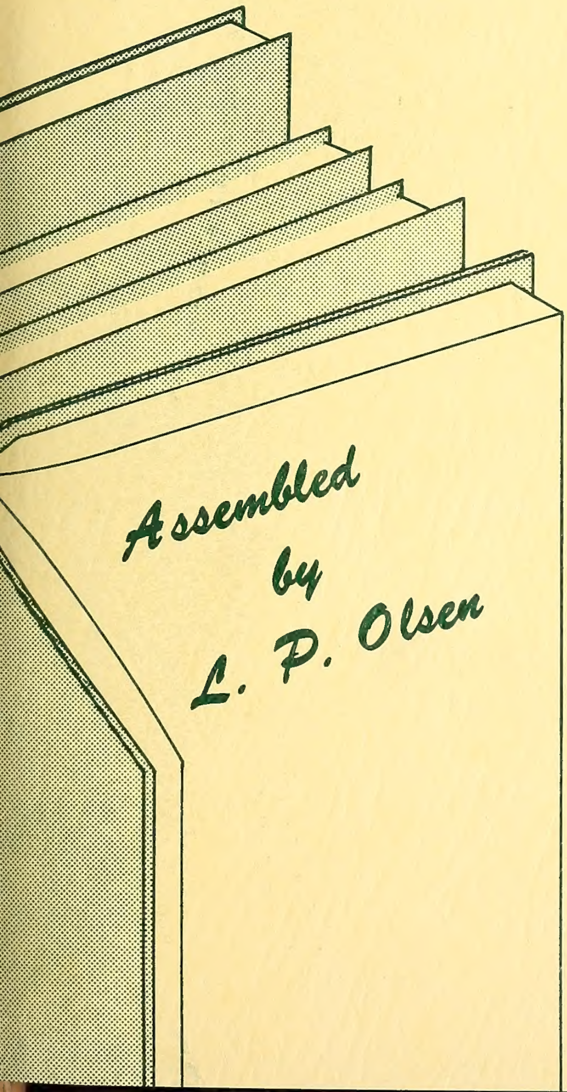
Publications of the LAKE STATES FOREST EXPERIMENT STATION

1956 - 1960



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STATION PAPER NO. 39
SUPPLEMENT NO. 1
JULY 1961

LAKE STATES FOREST EXPERIMENT STATION
M. B. Dickerman, Director
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

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Publications
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Lake States Forest Experiment Station
1956 - 1960

ABOUT THE LIST

The publications listed in this report constitute all the material published by the staff of the Lake States Forest Experiment Station during 1956 through 1960. Material published prior to 1956 is listed in our Station Paper 39, copies of which are still available and may be obtained on request.

To simplify the ordering procedures, we have given an order number to each item listed. The letters used in the order number indicate to some extent the type and length of publication. They are as follows:

TN - Technical Note; 1- or 2-page items discussing a small experiment or a facet of some larger experiment.

SP - Station Paper; generally a progress report on a long-term experiment.

TB - Technical Bulletin; usually the full, final report of a research project or of a major segment of a large research project.

PRR - Production Research Report; directly concerns production of timber.

AH - Agriculture Handbook; includes information for ready reference, such as manuals and guidebooks.

FPL - Forest Pest Leaflet; carries popular material on applying the results of research for protection of timber against insects and disease.

R - Reprint; usually an article written for a professional periodical but also may be miscellaneous material such as nonseries items published by the Station and popular-style articles in nontechnical magazines.

IMPORTANT

When ordering from this list, please give the exact order number of the publications you wish (i.e., TN-589, SP-80, TB-1076, etc.). Arrange the numbers within any series in order, with the smallest number first and the largest number last. This will prevent duplication and will greatly facilitate filling your order. Only items with an asterisk are available. Send order to Director, Lake States Forest Experiment Station, St. Paul Campus, University of Minnesota, St. Paul 1, Minn.

GENERAL FORESTRY

	Order No.
Arbogast, Carl, Jr., and Arend, John L. 1957. RESEARCH OF THE U. S. FOREST SERVICE IN MICHIGAN. Northeast. Logger 5(12): 22, 23, 44, illus. (A description of forest research facilities, past results, and proposed future forest research in Michigan.)	R-40
Cross, Robert L. 1958. RESEARCH BY THE U. S. FOREST SERVICE ON MICHIGAN'S UPPER PENINSULA. Mich. Tech. Forester, pp. 42-44. (A description of forest research facilities and results of the Lake States Forest Experiment Station on the Upper Peninsula of Michigan.)	R-95
Dickerman, M. B. 1956. REVIEW OF "FOREST AND RANGE POLICY: ITS DEVELOPMENT IN THE UNITED STATES," by Samuel T. Dana. Jour. Farm Econ. 38: 1075-1077.	R-1
Dickerman, M. B. 1960. ACHIEVING FULL USE OF FOREST LAND. U. S. Forest Serv., Lake States Forest Expt. Sta. (no series), 9 pp. (Processed.) (Discusses the many and various demands made on forested land and the need to manage it to obtain the greatest possible benefits.)	R-184
Kobs, Harry W., and Chase, Clarence D. 1959. INCREASING EFFICIENCY OF PARALLAX BAR WITH ZEISS MIRROR STEREOSCOPE. Photogram. Engin. XXV(1): 102, illus. (Suggests a combination of several instruments to facilitate fast, accurate stereoscopic measurements.)	R-138*
Lake States Forest Experiment Station 1956. ANNUAL REPORT FOR 1955. 85 pp., illus. (Processed.) (Describes briefly the Lake States timber situation, new station activities, progress on current projects, and plans for 1956.)	R-2
Lake States Forest Experiment Station 1957. ANNUAL REPORT, 1956. 71 pp., illus. (Processed.) (Describes briefly the new projects and progress on established projects during 1956.)	R-41
Lake States Forest Experiment Station 1958. ANNUAL REPORT FOR 1957. 45 pp., illus. (Processed.) (The first part of the Report considers some of the most significant events in Station research during the year. The second and main part reviews research progress in reforestation, discusses some studies under way, and examines briefly some of the needs that have become evident.)	R-96
Lake States Forest Experiment Station 1959. ANNUAL REPORT, 1958. 76 pp., illus. (Processed.) (Describes briefly the new projects and the progress on established projects during 1958.)	R-139*

Order No.

Lake States Forest Experiment Station.
1960. 1959 ANNUAL REPORT. 71 pp., illus. (Processed.) R-185*
(Examines the forest protection situation in the Lake States and its related research needs. Describes some of the current research under way on forest insects, diseases, and fire, and touches on future plans.)

McCulley, Robert D.
1960. REVIEW OF "LOBLOLLY PINE: ITS USE, ECOLOGY, REGENERATION, PROTECTION, GROWTH, AND MANAGEMENT," by W. G. Wahlenberg. Jour. Forestry 58: 977-979. R-186

Olsen, L. P., and Woodworth, H. A.
1956. PUBLICATIONS OF THE LAKE STATES FOREST EXPERIMENT STATION, 1923-1955. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 39, 130 pp. (Processed.) SP-39*
(Lists publications by author within subject matter classifications; includes special lists of serial publications.)

Rudolf, Paul O.
1957. ZON, PIONEER IN FOREST RESEARCH. Sci. 125(3261): 1283-1284. R-42*
(Brief biography of Raphael Zon and listing of his major achievements in forest research.)

Rudolf, Paul O.
1958. S. R. GEVORKIANTZ, FOREST BIOMETRICIAN. Sci. 128(3338): 1557. R-97
(Brief biography of S. R. Gevorkiantz and listing of his major achievements.)

Rudolf, Paul O.
1960. REVIEW OF "DIE EICHEN" (THE OAKS) by Joachim Krahl-Urban. Forest Sci. 6: 252. R-187

Stoeckeler, J. H.
1957. REVIEW OF "WISCONSIN'S RENEWABLE RESOURCES" by James A. Larsen. Jour. Forestry 55: 472. R-43

Weitzman, Sidney
1957. NEEDED--A FOREST RESEARCH PROGRAM FOR SOUTHWEST WISCONSIN. Wis. Conserv. Bul. 22(3): 28-33, illus. R-44
(Describes the condition of the forests in southwest Wisconsin with respect to both timber production and watershed protection. Discusses the problems and conflicts which have brought about existing conditions. Outlines the research program needed to solve current problems.)

Weitzman, Sidney
1960. SHOW-ME TOUR FOR WORLD FORESTERS. Conserv. Volunteer 24 (138): 39-43, illus. R-188
(Describes tour of forestry activities in Minnesota by members of World Forestry Congress.)

ARTIFICIAL REGENERATION

(Seed and nursery studies, direct seeding, and planting)

Order No.

Benzie, John W.

1960. VIABILITY OF BALSAM FIR SEED DEPENDS ON AGE OF TREE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 591, 2 pp., illus. (Processed.) TN-591*

(Seed viability generally decreased with tree age after reaching a peak of 68 percent potential germination for a tree 41 years of age. Actual germination of seed from the oldest tree tested, 155 years, was 3 percent, and potential germination was 10 percent.)

Clausen, Knud E., and Rudolf, Paul O.

1958. GERMINATION OF 29-YEAR-OLD RED PINE SEED. Univ. Minn. Forestry Note 72, 2 pp. (Processed.) R-98

(Red pine seed stored for 29 years in sealed containers still had some viability when stored in an unheated attic. Storage in a fruit cellar and in a cold room gave better results. In all instances viability has decreased markedly since 10-year results were obtained.)

Guilkey, Paul C., and Westing, Arthur H.

1956. EFFECTS OF INITIAL SPACING ON THE DEVELOPMENT OF YOUNG JACK PINE IN NORTHERN LOWER MICHIGAN. Mich. Acad. Sci., Arts, and Letters Papers XLI (1955 meeting): 45-50. R-3

(This study demonstrates the effects of stand density on the growth of jack pine at age 15 years. The diameter growth of all trees had been impaired at spacings less than 3x3 feet. Height growth of dominants was not affected by stand density. Spacings of 5x5 feet to 7x7 feet are satisfactory for both growth and development until commercial thinnings can be made.)

Roe, Eugene I.

1960. AUGUST-COLLECTED CONES YIELD POOR RED PINE SEED. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 575, 2 pp. (Processed.) TN-575*

(Red pine cones collected in the third week of August produced one-fifth less seed than cones collected in September. Moreover, the seed showed only 54 percent germination compared to 85 percent for September seed.)

Roe, Eugene I.

1960. RESTORING SWAMP CONIFERS ON BRUSHY LOWLAND REQUIRES ADEQUATE BRUSH CONTROL, LARGE STOCK, AND CAREFUL PLANTING. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 584, 2 pp. (Processed.) TN-584*

(Tests in northern Minnesota indicate that plantings of black spruce and tamarack on brushy lowland have a reasonable chance of success if the following precautions are taken: (1) Spray the brush with herbicides; (2) use transplant stock and plant no later than the spring following spraying; (3) plant on the hummocks and only when the surface is not frozen; (4) avoid concentrations of dense grass; (5) leave an unplanted buffer strip as hare insurance.)

Order No.

Roe, Eugene I., and Block, August E.
1957. AERIAL SPRAYING OF UPLAND BRUSH BEFORE PLANTING EFFECTIVELY REDUCES NEED FOR PLANTATION RELEASE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 502, 2 pp. (Processed.) TN-502*

(Aerial spraying a brushy upland site with 2,4-D and 2,4,5-T in July 1954 not only made planting easier the next spring but also did an excellent job of brush suppression. Two growing seasons later, only 20 percent of the planted red pine and white spruce needed brush release compared to 66 percent in the unsprayed brush alongside. These results were obtained for about $6 per acre, or one-third the cost of disking, the usual method of preparing such sites for planting.)

Rudolf, Paul O.
1956. TREE PLANTING IN LOWER MICHIGAN SANDBLOWS. Minn. Acad. Sci. Proc. 22 (1954 meeting): 85-90. R-4*

(Ten years after planting on a large sandblow, jack pine, Scotch pine, red pine, and pitch pine have grown and survived best. Brush broadcast between plants has improved growth, especially of white pine, white ash, hybrid poplars, and red oak.)

Rudolf, Paul O.
1959. REVIEW OF "CONIFERS: SOUTH AFRICAN METHODS OF CULTIVATION" by W. E. Hiley. Jour. Forestry 57: 931, 934. R-140

Stoeckeler, J. H.
1957. ANNUAL LUPINES AND OTHER COVER CROPS FOR THE FOREST NURSERIES OF THE LAKE STATES. Soil Sci. Soc. Amer. Proc. 21: 543-546. R-45

(Blue, white, and sweet yellow lupines were tested as a green manure crop in forest nurseries in northeastern Wisconsin and Michigan. Also tested were vetch, soybeans, seradella, and rye for comparisons. Sweet yellow lupine produced on an average 4,392 pounds of ovendry bulk per acre with an average nitrogen content of 89 pounds per acre. Blue lupine and hairy vetch on occasion gave good results, but were not as consistent as yellow lupine.)

Stoeckeler, J. H.
1958. PRELIMINARY OBSERVATIONS OF PERENNIAL LUPINE AS A COVER CROP IN FIELD-PLANTING SITES AND FOREST NURSERIES IN WISCONSIN. Soil Sci. Soc. Amer. Proc. 22: 170-173, illus. R-99*

(Perennial lupines, introduced from Europe and tested as a cover crop in the field and in forest nurseries show promise as a leguminous soiling crop on moderately acid forest soils in Wisconsin if grown for at least 2 or 3 years. They will produce 1 to 2 tons of organic bulk per acre.)

Stoeckeler, Joseph H., and Arneman, Harold F.
1960. FERTILIZERS IN FORESTRY. Adv. in Agron. 12: 127-195, illus. R-189

(Gives a comprehensive review of literature on the use of fertilizers in forest nurseries and in natural and planted stands, with considerable original data on the effects of fertilizers, pH amendment, and mycorrhizal inoculation in forest nurseries.)

Stoeckeler, J. H., and Jones, G. W.
1957. FOREST NURSERY PRACTICE IN THE LAKE STATES. Forest Serv., U. S. Dept. Agr., Agr. Handbook 110, 124 pp., illus. AH-110*

Order No.

(This book covers all aspects of nursery practice in the Lake States. Major items included are collection and handling of seed; how to select and develop a nursery site; equipment; soil management; age classes of stock needed for reforestation; seedbed preparation and sowing; soil moisture and irrigation; seedbed care during germination and seedling stage; transplanting; hardening off; special preparation methods; nursery protection, especially against insects, disease, and rodents; inventory methods; and the lifting, grading, packing, storing, and shipping of trees.)

Stoeckeler, J. H., and Skilling, D. D.
1959. DIRECT SEEDING AND PLANTING OF BALSAM FIR IN NORTHERN WISCONSIN. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 72, 22 pp., illus. (Processed.) SP-72*

(Trials in northeastern Wisconsin indicate the conditions required for successful direct seeding and planting of balsam fir. In general, seeding success was poor and planting results favorable. In many instances white spruce gave better planting results than did balsam fir.)

Strothmann, R. O., and Conover, D. F.
1960. A FIELD TEST OF THE BAKER SEED TOOL IN NORTHEASTERN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 579, 2 pp. (Processed.) TN-579*

(The Baker Seed Tool was tested on six areas on the Superior National Forest, using red pine and jack pine seed. Although none of the treatments could be considered successful, the study showed spring seeding to be superior to fall seeding, and screening against rodents to be superior to leaving the spots unscreened.)

Voigt, G. K., Stoeckeler, J. H., and Wilde, S. A.
1958. RESPONSE OF CONIFEROUS SEEDLINGS TO SOIL APPLICATIONS OF CALCIUM AND MAGNESIUM FERTILIZERS. Soil Sci. Soc. Amer. Proc. 22: 343-345. R-100

(Yellowing of the outer needle ends of pine seedlings growing in several northern Wisconsin nurseries was corrected by applying dolomitic limestone at 1 ton per acre. The deficiency symptoms were attributed to inadequate amounts of magnesium and calcium.)

Watt, Richard F.
1960. A TEST OF WOOD FIBER PADS AS A SEEDBED MULCH. U. S. Forest Serv., Tree Planters' Notes 41: 5-7. R-190*

(Wood fiber pads were used as a mulch in seed flats in a greenhouse test with jack and red pines and black and white spruces. Various thicknesses of pads were used, but even the thinnest one, which would be difficult to apply on large beds in a nursery because of low tensile strength, was penetrated by the germinating seeds with difficulty.)

STAND IMPROVEMENT

(Release, thinning, pruning, and cull tree removal)

Arend, John L.
1956. CONTROL OF UNDESIRABLE HARDWOODS IN FOREST MANAGEMENT IN THE LAKE STATES. Weed Soc. of Amer. Abstracts, (1955 meeting) p. 34. R-5

Order No.

(Describes chemical herbicide treatments recommended for controlling undesirable hardwoods in the Lake States for forest management purposes.)

Arend, John L.
1959. AIRPLANE APPLICATION OF HERBICIDES FOR RELEASING CONIFERS. Jour. Forestry 57: 738, 740, 742, 744-745, 747-749. R-141*
(Developments in herbicidal spraying with aircraft for conifer release are brought together. Application of available knowledge is discussed and items still needing research attention are mentioned. Importance of competent aircraft operators is stressed.)

Arend, John L., and Roe, Eugene I.
1960. HOW TO RELEASE CONIFERS IN THE LAKE STATES WITH CHEMICALS. U. S. Forest Serv., (preprint), 31 pp., illus. (Processed.) R-191*
(A description of the present status of the different chemical methods used for release of natural and planted pines and other conifers from undesirable hardwood trees and brush. The information presented is based on research results obtained by the authors in lower Michigan and northern Minnesota.)

Benzie, John W., and Cross, Robert L.
1959. HEAVY THINNING INCREASES TREE SIZE AND YIELD IN AN UPPER MICHIGAN NORTHERN HARDWOOD POLE STAND. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 560, 2 pp. (Processed.) TN-560*
(Removing one-third of the volume by cutting the poorer trees in a young northern hardwood pole stand did not appreciably change the net growth per acre during the first 9 years. The growth, however, was concentrated on fewer and better trees, and the thinning utilized many trees that otherwise might have been lost to mortality.)

Buckman, R. E., and Roe, E. I.
1958. EFFECTS OF PRUNING ON THE FORM GROWTH OF A RED PINE PLANTATION. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 533, 2 pp. (Processed.) TN-533*
(Changes of form in a red pine plantation pruned to 22 to 25 feet were followed by diameter measurements at 2, 4.5, 8, and 12 feet above the ground. Sixteen growing seasons later, the 50 pruned trees showed no changes in form over the 50 unpruned trees. The latter, however, made slightly higher diameter growth at all points of measurement.)

Conover, David F.
1957. DOMINANT AND CODOMINANT SUGAR MAPLE TREES SHOULD BE FAVORED IN THINNING YOUNG STANDS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 509, 2 pp., illus. (Processed.) TN-509*
(The success of sugar maple crop trees as measured by crown position 16 years after release depended on original crown position and degree of thinning. Intermediate and suppressed stems were poor risks as crop trees. Only about 15 percent of the intermediates had improved their crown position by 1954 on the heavier thinnings, and results were poorer on light thinnings. Codominants benefited most from thinning.)

Order No.

Conover, David F.
1957. EARLY THINNING AND PRUNING AFFECT LIMB-FREE LENGTH OF NORTHERN HARDWOODS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 503, 2 pp. (Processed.) TN-503*

(Thinning and pruning of an 11-year-old northern hardwood stand showed the following results in limb-free length 16 years later: Pruning of sugar maple on unthinned plots was unnecessary because of rapid natural pruning, but on thinned plots pruning increased limb-free length. American elm benefited from pruning on both thinned and unthinned plots because of its heavy branching habit and persistent dead limbs.)

Conover, D. F.
1958. EARLY THINNINGS HAVE INCREASED FORKING IN A NORTHERN HARDWOOD STAND. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 532, 2 pp., illus. (Processed.) TN-532*

(Nineteen years after thinning an 11-year-old American elm and sugar maple stand, crop-tree forking has increased in direct relation to the intensity of treatment.)

Conover, D. F., and Ralston, R. A.
1959. RESULTS OF CROP-TREE THINNING AND PRUNING IN NORTHERN HARDWOOD SAPLINGS AFTER NINETEEN YEARS. Jour. Forestry 57: 551-557, illus. R-142*

(Results in 1957 from noncommercial crop-tree thinnings made in 1938 and 1946 in a northern hardwood sapling stand showed a definite advantage in board-foot volume growth for plots with the widest crop-tree thinning radius. Crop-tree mortality was less on the thinned plots, but forking was more frequent.)

Dosen, R. C., Stoeckeler, J. H., and Kilp, F. G.
1957. MECHANIZED THINNING IN JACK PINE SAPLINGS. Jour. Forestry 55: 201-204, illus. R-46*

(Mechanical thinning of 2,540 acres of dense jack pine reproduction and saplings was done at 40 to 50 percent of the cost of thinning with handtools. A self-propelled 26-inch circular saw was used to cut swaths at 5- to 6-foot intervals, and portable 8- to 10-inch circular saws were used for finishing the job. Trees with a live crown ratio of 30 percent or more were favored.)

Ralston, Robert A., and Lemmien, Walter
1956. PRUNING PINE PLANTATIONS IN MICHIGAN. Mich. State Univ. Agr. Expt. Sta. Cir. Bul. 221, 28 pp., illus. R-6*

(Outlines recommended pruning practices and methods for pine plantations. Covers need for pruning, tools, and systems adaptable to various growth conditions, and possible financial returns. It presents the results of research in terms for the layman.)

Roe, Eugene I.
1957. MEASURING THE RESULTS OF AERIAL SPRAYING WITH HERBICIDES FOR FORESTRY PURPOSES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 492, 2 pp. (Processed.) TN-492*

(Taking actual measurements of results is the only sure way to appraise aerial brush control jobs. A simple and accurate sampling method is described.)

Order No.

Roe, Eugene I.
1959. DETERMINING MINIMUM AMOUNTS OF HERBICIDE NEEDED FOR AERIAL BRUSH CONTROL. Weeds 7: 178-183, illus. R-143*
(Describes the equipment and technique used in northern Minnesota to determine the minimum amounts of herbicide in terms of pounds and volume of solution per acre needed to control brush of different species and densities.)

Rudolf, Paul O., and Watt, Richard F.
1956. CHEMICAL CONTROL OF BRUSH AND TREES IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 41, 58 pp., illus. (Processed.) SP-41*
(Reviews recent developments in chemical control of Lake States woody plants as reported in the literature.)

Scholz, Harold F., and Trenk, Fred B.
1959. SIMPLE MEASURES CAN IMPROVE WISCONSIN FARM WOODLANDS: THE MIXED-OAK TYPE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 559, 2 pp. (Processed.) TN-559*
(Six improvement cuttings were made on the 64-acre Dundee Timber Harvest Forest during the first 10-year cutting cycle. The sawtimber volume at the end of the period was 21 percent greater than at the beginning, and the quality of the stand was better because of removal of the poorer trees.)

Skilling, Darroll D.
1957. TWELVE-YEAR RESULTS OF A MECHANICAL THINNING IN OVER-DENSE JACK PINE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 489, 2 pp. (Processed.) TN-489*
(Gives results of using an Athens disk-plow to thin jack pine saplings by three different methods. Leaving 3-foot strips between 6-foot disked areas provided best release.)

Skilling, D. D.
1957. IS THE EPICORMIC BRANCHING ASSOCIATED WITH HARDWOOD PRUNING WOUNDS INFLUENCED BY TREE CROWN CLASS? U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 510, 2 pp. (Processed.) TN-510*
(A study of artificially pruned northern hardwoods revealed the importance of tree crown class on the development of epicormic branches following pruning; 87 percent of the pruned suppressed trees developed epicormic branches as compared with only 1 percent of the pruned dominant trees.)

Skilling, D. D.
1958. WOUND HEALING AND DEFECTS FOLLOWING NORTHERN HARDWOOD PRUNING. Jour. Forestry 56: 19-22, illus. R-101*
(A study of the importance of healing rates, lumber defects, and epicormic branching following artificial pruning of an 11-year-old stand of northern hardwoods. Showed that no particular problems exist.)

Skilling, Darroll D.
1959. PRUNING HARDWOODS IMPROVES QUALITY AND SHOWS LITTLE EVIDENCE OF FOSTERING DECAY. The Timberman LX (5): 64-66, illus. R-144*
(Results of several hardwood pruning studies indicate that hardwood pruning is a practical method of improving timber quality.)

Order No.

Skilling, Darroll D.
1959. RESPONSE OF YELLOW BIRCH TO ARTIFICIAL PRUNING. Jour. Forestry 57: 429-432, illus. R-145*

(Ten-year results show that yellow birch will respond favorably to artificial pruning. Pruning to 50 percent of total height had no effect on diameter growth. Small wounds under 2.0 inches healed rapidly with no evidence of decay. However, where large branches were not pruned flush with the bark, ingrown bark developed during healing; this indicated the importance of careful flush pruning.)

Slabaugh, Paul E.
1957. DO PRUNED RED PINE TREES REMAIN DOMINANT? U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 476, 2 pp., illus. (Processed.) TN-476*

(Pruning crop-trees in excess of 50 percent of the live crown length resulted in loss of dominance in a 5-year period following treatment. Percent of crop trees losing dominance increased with severity of pruning.)

Slabaugh, Paul E.
1957. THE EFFECTS OF LIVE CROWN REMOVAL ON THE GROWTH OF RED PINE. Jour. Forestry 55: 904-906, illus. R-47*

(Crop trees were pruned to 30, 50, 70, and 90 percent of their live crown length, and growth over a 5-year period compared to that of unpruned trees. Losses in height and diameter growth and dominance resulted when 70 and 90 percent of the live crown was removed.)

HARVEST CUTTINGS AND NATURAL REGENERATION

(Cutting methods, stand density, seedbed, and seed crop)

Arbogast, Carl, Jr.
1957. BASIC PRINCIPLES OF FOREST MANAGEMENT IN NORTHERN HARDWOODS. Northeast. Logger 6 (5): 22, 23, 58-60, illus. *Also* published in mimeo form by the Station in 1956. R-48*

(Reviews in layman's terms the recommended practices for all-aged management of northern hardwoods and how to develop the ideal stand in our present forests.)

Arbogast, Carl, Jr.
1957. MARKING GUIDES FOR NORTHERN HARDWOODS UNDER THE SELECTION SYSTEM. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 56, 20 pp., illus. SP-56*

(Prescribes marking guides for properly regulated stands of all-aged northern hardwood under the selection system of management, and for irregular or unmanaged stands whose owner wishes to develop the conditions recommended for a productive forest.)

Arbogast, Carl, Jr.
1957. MANAGEMENT PRACTICES IN NORTHERN HARDWOODS. The Timber Producer 13 (2): 8-9, illus. R-49

(A discussion of past and present management practices in the northern hardwood type.)

HARVEST CUTTINGS

Order No.

Batzer, H. O.
1960. TWO CASES OF WIND-DAMAGE TO BALSAM FIR AFTER CUTTING. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 590, 2 pp. (Processed.) TN-590*

(Losses are given for storms of known wind velocity in two areas of partial cut and commercial clear cut balsam fir stands; one area was near International Falls and the other near Grand Marais, Minn.)

Benzie, John W.
1959. SUGAR MAPLE AND YELLOW BIRCH SEED DISPERSAL FROM A FULLY STOCKED STAND OF MATURE NORTHERN HARDWOODS IN THE UPPER PENINSULA OF MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 561, 1 p. (Processed.) TN-561*

(Indicates that an adequate amount of seed can be expected for at least 5 chains in all directions during good seed years. Sugar maple seed was nearly all on the ground before snowfall, but most of the yellow birch seed fell on the snow.)

Buckman, Robert E.
1960. HIGH GROWTH RATE MAINTAINED BY 140-YEAR-OLD RED PINE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 587, 2 pp. (Processed.) TN-587*

(Over a 33-year period, a red pine stand has grown an average of about 500 board feet per acre. During the same period, about 22,000 board feet per acre have been removed as thinnings, and about 10,000 board feet remain as growing stock.)

Buckman, Robert E., and Zasada, Z. A.
1960. MINNESOTA'S NATIVE PINE PAYS OFF. Conserv. Volunteer 23 (135): 7-10, illus. R-192

(Growth rates from four long-term red pine experiments are described to show the potential of Minnesota's forest land.)

Buckman, Robert E., and Zasada, Z. A.
1960. FIVE-YEAR RESULTS OF A GROWING-STOCK DENSITY STUDY IN 85-YEAR-OLD WHITE PINE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 589, 2 pp. (Processed.) TN-589*

(A white pine stand, divided into 5 compartments, was thinned to 80, 100, 120, and 140 square feet of basal area per acre. Five years later the 100-, 120-, and 140-square-foot levels had increased by over 4,000 board feet per acre. The 80-square-foot treatment grew 3,300 board feet in the same period.)

Church, Thomas W., Jr.
1960. RESIDUAL STAND DENSITY AND THE EARLY DEVELOPMENT OF NORTHERN HARDWOOD REPRODUCTION IN UPPER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 593, 2 pp. (Processed.) TN-593*

(Mature northern hardwood stands were cut to residual basal area densities of 30, 50, 70, and 90 square feet per acre. Observations made 2 and 5 years after logging showed that residual stand density had no significant effect upon the number of seedlings present or the number of quadrats stocked with sugar maple. However, stand density did influence the percentage of quadrats stocked with yellow birch. Stand densities of 30 and 50 square feet per acre gave a greater increase in the percentage of quadrats stocked with birch than did denser overstories.)

Order No.

Church, Thomas W.
1960. INITIAL EFFECT OF RESIDUAL STOCKING LEVELS ON BASAL AREA PRODUCTION IN NORTHERN HARDWOOD STANDS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 581, 2 pp. (Processed.) TN-581*

(A residual stocking level of 30 square feet per acre in basal area resulted in less gross production than the three higher levels of 50, 70, and 90. There was no significant difference between the three higher levels during the first 5 years after cutting.)

Cooley, John H., and Lord, W. B.
1958. A STUDY OF ASPEN-BALSAM FIR CUTTING METHODS IN NORTHERN WISCONSIN--FIVE-YEAR RESULTS. Jour. Forestry 56: 731-736, illus. R-102*

(A progress report on harvest cuttings in a mixed aspen-balsam fir stand. Cutting methods included complete clear cutting of aspen and varying degrees of partial cutting of the aspen overstory. Complete clear cutting resulted in maximum growth of balsam fir, but a 2-stick or 3-stick limit is considered more practical.)

Cross, Robert L.
1958. GROWTH, VIGOR, AND MORTALITY OF RESIDUAL HEMLOCK-HARDWOOD FOLLOWING A PARTIAL CUTTING. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 526, 2 pp. (Processed.) TN-526*

(Hemlock mortality was slight and limited to the first 7 years after cutting. The hardwoods had less mortality, but it continued throughout the entire period. During the last 5 years the hemlock trees classed as normal have increased in diameter growth while the hardwoods have decreased.)

Gammon, A. D., Rudolph, V. J., and Arend, J. L.
1960. REGENERATION FOLLOWING CLEARCUTTING OF OAK DURING A SEED YEAR. Jour. Forestry 58: 711-715, illus. R-193

(Data on the reproduction following the clearcutting of an excellent 45-acre tract of oak sawtimber were collected periodically for 7 years after logging. Adequate reproduction developed to furnish a fully stocked new stand. However, the species composition of the new stand had little resemblance to that of the previous stand. Adequate oak reproduction was not obtained by clear cutting during a bumper seed year.)

Gevorkiantz, S. R.
1956. MANAGING HARDWOODS FOR QUALITY INCREMENT. Jour. Forestry 54: 837-840, illus. R-7*

(The need for a more factual and systematic basis for appraisal of quality increment is discussed.)

Godman, Richard M.
1957. DISKING INCREASES THE NUMBER AND GROWTH OF YELLOW BIRCH SEEDLINGS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 511, 2 pp. (Processed.) TN-511*

(Stocking and survival of yellow birch increased as the amount of the quadrat disked increased. Although mortality was high in all scarified areas, the number of seedlings surviving after 3 growing seasons on the quadrats with 75 percent of their area disked was 152,000 per acre. Seedling height growth was also increased by scarification.)

Order No.

Godman, Richard M., and Krefting, Laurits W.
1960. FACTORS IMPORTANT TO YELLOW BIRCH ESTABLISHMENT IN UPPER MICHIGAN. Ecology 41: 18-28, illus. R-194*

(Discusses regional differences of factors affecting establishment and early growth. Evaluates seed production, seedbed condition, competition, precipitation and temperatures, frost, shade requirements, and injury by animals in a seed-tree cutting in the hemlock-yellow birch cover type. Scarification to expose mineral soil on 50 percent or more of the area in conjunction with recommended silvicultural practice is most favorable for seedling development.)

Guilkey, Paul C.
1958. MANAGING RED PINE FOR POLES IN LOWER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 57, 21 pp., illus. (Processed.) SP-57

(The number of trees in Lower Michigan that are suitable for utility poles was estimated at 215,000, with a potential supply of 1.6 million poles from trees now between 5.0 and 9.5 inches d.b.h. The major pole defects are sweep, caused mainly by snow damage to sapling-sized trees, and crook, which apparently is caused by ice damage to young stands. Knots and limbiness, the other common defects, can be reduced by maintaining stand densities at 140 square feet of basal area per acre or more.)

Heinselman, M. L.
1957. LIVING SPHAGNUM FOUND MOST FAVORABLE SEEDBED FOR SWAMP BLACK SPRUCE IN MINNESOTA STUDY. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 504, 2 pp. (Processed.) TN-504*

(Three seasons after clear cutting in strips, *Sphagnum* seedbeds accounted for 93 percent of the seedlings, yet occupied only 43 percent of the total seedbed area.)

Heinselman, M. L.
1958. WIND-CAUSED MORTALITY IN MINNESOTA SWAMP BLACK SPRUCE IN RELATION TO CUTTING METHODS AND STAND CONDITIONS. Soc. Amer. Foresters Proc.1957: 74-77, illus. R-103*

(Stem breakage and uprooting by wind were the most frequent causes of mortality in a cutting study near Big Falls, Minn. Losses were minor in clear-cut strips and patches and in light partial cuttings. They were serious only in heavy shelterwood cuttings in tall old stands on good sites, with west exposure.)

Heinselman, M. L.
1959. NATURAL REGENERATION OF SWAMP BLACK SPRUCE IN MINNESOTA UNDER VARIOUS CUTTING SYSTEMS. U. S. Dept. Agr. Prod. Research Rpt. 32, 22 pp., illus. PRR-32*

(Studies on the Big Falls Experimental Forest point toward even-aged management for swamp black spruce. Clear cutting in strips or patches, with slash burning are effective methods because they eliminate overstory competition, provide a seed source, and expose as much good seedbed as possible.)

McCulley, Robert D.
1956. MANAGING NORTHERN HARDWOODS FOR TIMBER QUALITY PRODUCTION. Timber Prod. Bul. (Mich. and Wis.) 161: 2-3, illus. R-8

(Quality considerations demand that, when sawtimber is cut, some good stems with high growth potential or good seed trees

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of desirable species must be left. In young stands the better stems must be favored in partial cuttings or cultural operations.

Ralston, R. A.
1957. NORTHERN HARDWOOD MANAGEMENT PROBLEMS. The Timber Producer 13 (3): 8-10, illus. R-50
(A discussion of the timber quality situation and general level of forest management in the Lake States; points out management problems needing additional emphasis.)

Roe, Eugene I.
1957. GROWTH OF ESTABLISHED BALSAM FIR REPRODUCTION GREATLY STIMULATED BY CUTTING. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 512, 2 pp. (Processed.) TN-512*
(Balsam fir stands typically have large numbers of small seedlings which live for a few years, only to be replaced by younger ones. Opening the crown canopy favors the growth and development of such seedlings into reproduction of more promising size. In a cutting study in northern Minnesota, only 3 to 7 percent of the original balsam seedlings were 1 foot or taller; 5 years later, the proportion was only 5 percent in the uncut check, 8 percent in the light cutting, but 10 to 27 percent in the three heavier cuttings.)

Rudolf, Paul O.
1956. 1955 FOREST SEED CROP GENERALLY FAIR IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 447, 2 pp. (Processed.) TN-447*

Rudolf, Paul O.
1957. 1956 FOREST TREE SEED CROP SUBNORMAL IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 501, 2 pp. (Processed.) TN-501*

Rudolf, Paul O.
1958. 1957 FOREST TREE SEED CROP ABOUT AVERAGE IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Experiment Station Tech. Note 540, 2 pp. (Processed.) TN-540*

Rudolf, Paul O.
1959. 1958 FOREST TREE SEED CROP POOR IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 565, 2 pp. (Processed.) TN-565*

Rudolf, Paul O.
1960. 1959 FOREST SEED CROP GENERALLY POOR IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 574, 2 pp. (Processed.) TN-574*
(Each of the above five Technical Notes shows seed crops for the principal forest tree species in percentage of full crops for several areas in the Lake States.)

Scholz, Harold F.
1959. FURTHER OBSERVATIONS ON SEEDBED SCARIFICATION SHOW BENEFITS TO NORTHERN RED OAK WERE TEMPORARY. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 555, 2 pp. (Processed.) TN-555*
(Reproduction counts made 7 years after the soil had been scarified in a well-stocked mixed oak forest showed no substantial

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difference in the number of northern red oak seedlings per acre on treated and untreated plots. Thus the favorable 2 to 1 ratio for scarification observed at the end of the second growing season had all but disappeared 5 years later.)

Scholz, Harold F.
1960. PRESENT STATUS OF OAK MANAGEMENT IN WISCONSIN. Iowa State Jour. Sci. 34: 649-660, illus. R-195*

(Studies have been carried on for 12 years to determine the feasibility of perpetuating northern red oak by means of natural and artificial regeneration. Several cutting methods and types of seedbed preparation were tried and evaluated.)

Scholz, Harold F. and DeVriend, A. J.
1957. NATURAL REGENERATION ON A 2-ACRE MIXED-OAK CLEAR CUTTING FIVE YEARS AFTER LOGGING. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 48, 11 pp., illus. (Processed.) SP-48*

(Observations made during the first 5-year period following the clear cutting of a 2-acre block of mature oak in Wisconsin indicate that seedling regeneration of northern red oak and other valuable species is adequate (7,080 stems per acre) for restocking. However, the final evaluation of clear cutting by small blocks cannot be made until we learn how many of these seedlings ultimately survive.)

Scholz, Harold F. and Trenk, Fred B.
1960. TIMBER YIELDS, WOOD INCREMENT, AND COMPOSITION OF REGENERATION IN A MANAGED HARDWOOD FOREST ON MORAINAL SOILS. Wis. Acad. Sci., Arts, and Letters Trans. (89th Ann. Meeting), pp. 11-29, illus. R-196*

(A case study of the possibilities of using a series of light partial cuttings to build up sawlog volume, improve timber quality, and provide more adequate natural regeneration in the mixed-oak forests of Wisconsin. Results for the initial 10-year-period indicate that the first two objectives were attained.)

Skilling, D. D.
1959. GROWTH OF SWAMP CONIFERS FOLLOWING PARTIAL CUTTING. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 71, 10 pp., illus. (Processed.) SP-71*

(A growth study of the first 10-year period following partial cutting of a swamp conifer stand showed total production in both cords and basal area was greatest for those plots with the heaviest residual stand density (about 180 square feet of basal area). Wind losses due to partial cutting were negligible.)

Stoeckeler, J. H., and Macon, John W.
1956. REGENERATION OF ASPEN CUTOVER AREAS IN NORTHERN WISCONSIN. Jour. Forestry 54: 13-16, illus. R-9*

(A survey of 46 cutover aspen stands in northern Wisconsin shows that the number of stems in the form of new regeneration is dependent primarily on how completely the overstory is removed, and on the years since logging. Site index of the original stand and season of logging had some effect. Considerable natural conversion is occurring to other species on the better sites.)

Order No.

Strothmann, Rudolph O., and Heinselman, Miron L.
1957. FIVE-YEAR RESULTS IN AN ASPEN SUCKER DENSITY STUDY. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 490. 2 pp. (Processed.) TN-490*

(During the first 5 years after thinning of a 1-year-old quaking aspen stand, stand density had little effect on height growth, but survival decreased with increasing density.)

Thornton, Philip L.
1957. PROBLEMS OF MANAGING UPPER MICHIGAN'S CONIFEROUS SWAMPS. Jour. Forestry 55: 192-197, illus. R-51*

(A discussion of the potential of mixed coniferous swamps in Michigan and some of the management problems.)

Thornton, Philip L.
1957. EFFECTS OF CUTTING METHODS ON ADVANCE REPRODUCTION IN TWO MATURE MIXED CONIFEROUS SWAMPS IN UPPER MICHIGAN. Jour. Forestry 55: 448-451, illus. R-52*

(Some measurable characteristics of reproduction in two mixed coniferous swamps, which were cut by five different methods.)

Trenk, F. B., and Scholz, H. F.
1960. THE WAUSAUKEE TIMBER HARVEST FOREST. Wis. Conserv. Bul. 25 (3): 28-31, illus. R-197

(The gross board-foot volume of a 70-year-old, 32-acre mixed white pine-red pine stand increased 46 percent in 11 years even though the area was given seven combination thinnings-improvement cuts during the same period. These harvests yielded almost $4,000 worth of forest products.)

Zasada, Zigmond A., and Buckman, Robert E.
1957. GROWTH AND YIELD OF A YOUNG RED PINE PLANTATION IN NORTHERN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 491, 2 pp. (Processed.) TN-491*

(A 22-year-old red pine plantation on the Pike Bay Experimental Forest has already produced nearly 26 cords of pulpwood to a 3-inch top. This unusually high growth rate is due largely to intensive ground preparation and release during its first few years.)

TREE IMPROVEMENT

(Genetics, vegetative propagation, and physiology)

Jensen, Raymond A., Schantz-Hansen, T., and Rudolf, Paul O.
1960. A STUDY OF JACK PINE SEED SOURCE IN THE LAKE STATES. Univ. Minn. Forestry Note 88, 2 pp., illus. (Processed.) R-198

(Included is a brief description of the study involving 29 Lake States sources set out in 17 plantations. Fifth-year average results in height development are given for six Minnesota plantations.)

Lake States Forest Tree Improvement Conference.
1958. PROCEEDINGS OF THIRD FOREST TREE IMPROVEMENT CONFERENCE, SEPT. 17, 18, 1957. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 58, 87 pp., illus. (Processed.) SP-58*

(Contains papers on applying tree improvement practices in the Lake States and recent advances in tree improvement in the Lake States and other regions.)

Order No.

Lake States Forest Tree Improvement Conference.
1960. PROCEEDINGS OF THE FOURTH LAKE STATES FOREST TREE IMPROVEMENT CONFERENCE, OCTOBER 6 AND 7, 1959. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 81, 60 pp., illus. (Processed.) SP-81*

(Includes a "short course" in forest genetics, current tree improvement activities in the region, reports of special subcommittees, and other activities of the Lake States Forest Tree Improvement Committee.)

Larson, Philip R.
1958. EFFECT OF GIBBERELLIC ACID ON FORCING HARDWOOD CUTTINGS FOR POLLEN COLLECTION. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 538, 2 pp. (Processed.) TN-538*

(Flower-bearing cuttings of red maple, paper birch, bigtooth aspen, quaking aspen, and pin-cherry treated with gibberellic acid broke dormancy earlier and developed more rapidly than controls did.)

Larson, Philip R.
1958. REVIEW OF "THE PHYSIOLOGY OF FOREST TREES," edited by Kenneth V. Thimann, William B. Critchfield, and Martin H. Zimmerman, 678 pp., illus., 1958. Jour. Forestry 56: 916-917. R-104

Larson, Philip R.
1959. PREPARATION OF SMALL WOOD BLOCKS FOR PHOTOMICROGRAPHY. Stain Technology 34: 155-156, illus. R-146*

(Describes a technique for bringing out the contrast between various wood elements for photomicrography by treating small wood blocks with levigated alumina.)

Larson, Philip R.
1959. THE TRANSITION OF EARLYWOOD TO LATEWOOD IN *PINUS RESINOSA* SEEDLINGS. Internatl. Assoc. of Wood Anatomists News Bul. 1959 (1): 3-4. R-147

(Presents a brief summary of an experiment which tested the hypothesis that summerwood development is related to the cessation of terminal height growth and bud set.)

Larson, Philip R.
1960. A PHYSIOLOGICAL CONSIDERATION OF THE SPRINGWOOD-SUMMERWOOD TRANSITION IN RED PINE. Forest Sci. 6: 110-122, illus. R-199*

(The transition from springwood to summerwood has been related to the cessation of activity of the terminal meristem. On the basis of experimental treatments involving debudding, daylength changes, and exogenous growth regulator applications, it was proposed that springwood formation results from high auxin activity, and the transition to summerwood occurs when auxin production decreases.)

Larson, Philip R.
1960. GIBBERELLIC ACID-INDUCED GROWTH OF DORMANT HARDWOOD CUTTINGS. Forest Sci. 6: 232-239. R-200*

(Gibberellic acid applied to dormant cuttings of a number of hardwood species induced preseasonal growth and development of the apical buds.)

Order No.

McCulley, Robert D.
1958. FOREST TREE IMPROVEMENT ACTIVITIES AT THE LAKE STATES STATION DURING THE PAST TWO YEARS. *In* Third Lake States Forest Tree Improvement Conf., Proc. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 58: 30-34. SP-58*

(Discusses Station projects during the past 2 years in physiology, white spruce grafting and breeding, the nursery sowing of exotic species of known origin, the assembling of seed of known origin of white spruce and eastern white pine from their entire ranges, studies of blister rust races, and the maintenance of older seed source, hybrid pine, and species test plots. Plans are to expand genetics work.)

McCulley, Robert D.
1958. FOREST TREE IMPROVEMENT IN THE LAKE STATES. Wis. Christmas Tree Prod. Assoc. Bul. 15: 3. R-105

(Brief comments on forest tree improvement research in the Lake States and its potential value for Christmas tree growers.)

Nienstaedt, Hans.
1956. THE FOUNDATION FOR SPRUCE IMPROVEMENT IN THE LAKE STATES. Wis.-Mich. Sect. Soc. Amer. Foresters, pp. 17-28. (Processed.) R-10

(A discussion of some of the methods used and results obtained in tree improvement work over the last decades. The characteristics of superior spruce trees are described in some detail.)

Nienstaedt, Hans.
1956. RECEPTIVITY OF PISTILLATE FLOWERS AND POLLEN GERMINATION TESTS IN THE GENUS *CASTANEA*. Zeitschrift für Forstgenetik 5 (2): 40-45. R-11

(The Japanese and Chinese chestnuts studied were protandrous. Female flowers are receptive 5 to 13 days after beginning of anthesis of male catkins. Effects of emasculation on nut yield were studied and chestnut pollen germination techniques explored.)

Nienstaedt, Hans.
1957. REVIEW OF "PLANT PROPAGATION" by John P. Mahlstede and Ernest S. Haber. Jour. Forestry 55: 383-384. R-53

Nienstaedt, Hans.
1957. NEW TESTS FOR DISEASE RESISTANCE IN TREES ARE NEEDED. Der Züchter Supp. 4: 84-87. R-54

(It is suggested that studies of the factors--particularly the chemical factors--causing disease resistance may reveal new methods for testing the resistance of host tissue directly. Possible methods of approach to such studies are discussed.)

Nienstaedt, Hans.
1958. HEIGHT GROWTH IS INDICATIVE OF THE RELATIVE FROST RESISTANCE OF HEMLOCK SEED SOURCES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 525, 2 pp., illus. (Processed.) TN-525*

(The severity of fall frost damage to 17 seed sources of hemlock grown in northern Wisconsin was closely correlated to the climate at the location where the seed originated. Relative resistance to frost injury could be predicted on the basis of seedling growth under controlled indoor conditions.)

Order No.

Nienstaedt, Hans.
1958. RECEPTIVITY OF FEMALE STROBILI OF WHITE SPRUCE. Forest Sci. 4: 110-115, illus. R-106*

(The period of receptivity of female strobili in white spruce was found to coincide with pollen shedding and to last 3 to 5 days. It is quite uniform on an individual tree and an entire tree can therefore be pollinated successfully in a single operation at the time of maximum pollen shedding.)

Nienstaedt, Hans.
1959. THE EFFECT OF ROOTSTOCK ACTIVITY ON THE SUCCESS OF FALL GRAFTING OF SPRUCE. Jour. Forestry 57: 828-832, illus. R-148*

(Results of fall grafting experiments with white spruce show that, while rootstock activity at the time of grafting has little effect on survival and growth of the grafts, the right combination of chilling and daylength is essential. Scheduling after grafting is discussed in detail.)

Nienstaedt, Hans.
1959. FALL GRAFTING OF SPRUCE AND OTHER CONIFERS. Plant Propagators Soc. Proc. 1958: 98-104. R-149

(Briefly discusses the grafting of 10 species of spruce during September and October. By exposing the grafts to a combination of controlled daylength and low temperature, good results can be obtained with most species. Grafting of red and white pine in the fall is also discussed.)

Nienstaedt, Hans.
1959. FOREST TREE IMPROVEMENT AT THE NORTHERN INSTITUTE OF FOREST GENETICS. In Proc. of the Com. on Forest Tree Breeding in Canada, Part II, 1958: Q-13-16. R-150

(Describes briefly some results in tree improvement and physiology and outlines the more important current work.)

Nienstaedt, Hans.
1960. THE ECOTYPE CONCEPT AND FOREST TREE GENETICS. In Fourth Lake States Forest Tree Improvement Conf. Proc. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 81: 14-25. (Processed.) SP-81*

(Briefly discusses the objectives of studies of racial variation and methods of study. The patterns of variation within a native species in terms of ecotypes and clines are discussed.)

Nienstaedt, Hans; Cech, Franklin C.; Mergen, Francois; Wang, Chi-Wu; and Zak, Bratislav.
1958. VEGETATIVE PROPAGATION IN FOREST GENETICS RESEARCH AND PRACTICE. Jour. Forestry 56: 826-839, illus. R-107*

(Reviews some of the more recent literature on the grafting, air-layering, and rooting of cuttings of forest trees. Our lack of understanding of the fundamentals controlling these processes is stressed, and a plea is made for more basic research on the subjects.)

Olson, Jerry S., and Nienstaedt, Hans.
1957. PHOTOPERIOD AND CHILLING CONTROL GROWTH OF HEMLOCK. Sci. 125 (3246): 492-494, illus. R-55

(The length of the period of growth in hemlock is a function of photoperiod. Maximum period of growth and therefore elongation

Order No.

is obtained at a 20-hour photoperiod. Other phases of the growth controlled or modified by photoperiod are dormancy and seed germination.)

Rudolf, Paul O.
1956. LAYING THE FOUNDATION FOR FOREST TREE IMPROVEMENT IN THE LAKE STATES. Wis.-Mich. Sect. Soc. Amer. Foresters Proc., pp. 1-7. (Processed.) R-12

(Brief discussion on forest tree improvement--what it is, how it is done, activities in the Lake States and similar regions, applications, and future prospects.)

Rudolf, Paul O.
1956. GUIDE FOR SELECTING SUPERIOR FOREST TREES AND STANDS IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 40, 32 pp., illus. (Processed.) SP-40*

(Discusses the traits of forest trees generally considered to reflect heredity strongly. Special traits to be sought are listed for a number of individual species.)

Rudolf, Paul O.
1957. PROSPECTS FOR TREE IMPROVEMENT OF NORTHERN HARDWOOD SPECIES. Timber Prod. 13: 2-3, illus. R-56

(The present potential of northern hardwoods can be improved by selection and controlled breeding of the best individuals, by crossing races within a species, and by crossing species within a genus. First attention probably should be directed to sugar maple, yellow birch, and basswood.)

Rudolf, Paul O.
1957. FOREST TREE SEED COLLECTION ZONES FOR THE LAKE STATES. Forestry Div., Mich. Dept. Conserv., (no series), 14 pp., illus. (Processed.) R-57

(Proposes a series of seed collection zones for the Lake States based on (1) a summation of normal average daily temperatures per year above 50° F. "growth degrees", and (2) mean January temperatures.)

Rudolf, Paul O.
1958. HIGHLIGHTS OF CURRENT FOREST TREE IMPROVEMENT ACTIVITIES IN THE LAKE STATES. In Northeast. Forest Tree Improvement Conf. Proc. 5: 11-13. (Processed.) R-108

(Brief summary of forest tree improvement activities by all agencies in the Lake States.)

Rudolf, Paul O.
1959. A BASIS FOR FOREST TREE SEED COLLECTION ZONES IN THE LAKE STATES. Minn. Acad. Sci. Proc. 24 (1956 meeting): 20-28, illus. R-151*

(Proposed seed collection zones for the Lake States are based on a summation of normal daily temperatures per year above 50° F. and mean January temperature. Development of 119 sources of red pine 20 years after planting showed agreement with these zones.)

Rudolf, Paul O.
1959. FOREST TREE IMPROVEMENT RESEARCH IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 74, 56 pp. (Processed.) SP-74*

Order No.

(Gives brief reports on 113 forest tree improvement research projects conducted by 11 agencies in the Lake States. Includes indexes by genera, research workers, and cooperators.)

Rudolf, Paul O.
1959. THE LAKE STATES FOREST TREE IMPROVEMENT COMMITTEE; ITS PURPOSE AND ACTIVITIES. In Proc. of Committee on Forest Tree Breeding in Canada (Fifth Meeting), Part II, 1957: N-1-4. (Processed.) — R-152

(Brief account of Lake States Forest Tree Improvement Committee covering its organization, membership, purposes, subcommittee activities, newsletter, and publications.)

Rudolf, Paul O.
1959. SEED PRODUCTION AREAS FOR THE LAKE STATES: GUIDELINES FOR THEIR ESTABLISHMENT AND MANAGEMENT. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 73, 16 pp., illus. (Processed.) — SP-73*

(Suggests standards and procedures for establishing seed production areas in the Lake States for red pine, jack pine, white pine, white spruce, and black spruce stands.)

Rudolf, Paul O.
1960. CURRENT FOREST TREE IMPROVEMENT RESEARCH IN THE LAKE STATES. In Proceedings of the Fourth Lake States Forest Tree Improvement Conference, U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 81: 46-47. (Processed.) — SP-81*

(Brief summary of current activities of 70 research workers in 11 research agencies conducting some 113 formal forest tree improvement studies in the Lake States.)

Rudolf, Paul O., and Nienstaedt, Hans.
1958. SPRUCE IMPROVEMENT RESEARCH AT THE LAKE STATES FOREST EXPERIMENT STATION--AN OUTLINE. In Northeast. Forest Tree Improvement Conf. Proc. 5: 54-57. (Processed.) — R-109

(Brief summary of Station's studies in provenience, ecotypic variation, selection, and breeding of spruces.)

Rudolf, Paul O., and Ochsner, H. E.
1959. REGISTERING AND MARKING SELECTIONS IN THE LAKE STATES; A REPORT OF A SUBCOMMITTEE OF THE LAKE STATES FOREST TREE IMPROVEMENT COMMITTEE. U. S. Forest Serv., No. Central Region, 10 pp. (Processed.) — R-153

(Recommends methods and forms for reporting superior or unusual forest trees in the Lake States. Includes a regional list of registers. Suggests methods for marking selected superior trees.

Rudolf, Paul O., and Slabaugh, Paul E.
1958. GROWTH AND DEVELOPMENT OF 10 SEED SOURCES OF SCOTCH PINE IN LOWER MICHIGAN (15-YEAR RESULTS). U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 536, 2 pp. (Processed.) — TN-536*

(Various European-origin Scotch pine were compared by lot and found to have significant differences in total height growth, and varying susceptibility to insect attack.)

Rudolf, Paul O., and Slabaugh, Paul E.
1958. GROWTH AND DEVELOPMENT OF 12 SEED SOURCES OF NORWAY SPRUCE IN LOWER MICHIGAN (15-YEAR RESULTS). U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 537, 2 pp. (Processed.) — TN-537*

Order No.

(Various European-origin Norway spruce were compared by lot and found to vary widely in survival, height growth, and injury according to seed origin.)

Santamour, Frank S., Jr., and Nienstaedt, Hans.
1956. THE EXTRACTION, STORAGE, AND GERMINATION OF EASTERN HEMLOCK POLLEN. Jour. Forestry 54: 269-270. R-13*
(Long daylength (20 hours) is beneficial in extraction of hemlock pollen from branches collected 3 months before normal pollen shedding. Hemlock pollen was stored successfully at 50 percent relative humidity and 1° to 16° C.)

Skilling, Darroll D.
1960. A TRACTOR-MOUNTED LADDER FOR TREE-CROWN STUDIES. Food and Agr. Organ. of the United Nations, Forestry Equip. Note A.20.60, 2 pp., illus. Also U. S. Forest Serv., Tree Planters' Notes 43: 9-10, illus. R-201
(Describes an aerial ladder mounted on a crawler tractor suitable for tree-crown studies up to 45 feet. The principal advantages of this device are its ability to travel rough forest terrain and its reasonable price (total cost $320 plus tractor)).

Slabaugh, Paul E., and Rudolf, Paul O.
1957. THE INFLUENCE OF SEED SOURCE ON THE DEVELOPMENT OF SCOTCH PINE AND NORWAY SPRUCE PLANTED IN LOWER MICHIGAN (15-YEAR RESULTS). Mich. Acad. Sci., Arts, and Letters Papers (1956) 42: 41-52, illus. R-58*
(Compares the performance of Scotch pine of 10 European origins and Norway spruce of 12 European origins with that of red pine and white pine of Michigan origin. The native species have been less subject to damaging agents and are growing faster.)

Stoeckeler, J. H.
1958. IMPROVEMENT OF STOCK QUALITY IN THE FOREST NURSERY. In Third Lake States Forest Tree Improvement Conf. Proc., U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 58: 8-15. (Processed.) SP-58*
(Stock quality in the nursery can be improved by use of proper age classes, fertilization, low density of seeding, culling, proper watering and weeding, root pruning, and use of the proper seed source.)

Stoeckeler, J. H., and Rudolf, Paul O.
1956. WINTER COLORATION AND GROWTH OF JACK PINE IN THE NURSERY AS AFFECTED BY SEED SOURCE. Zeitschr. f. Forstgen. u. Forstpflanzenzüchtung 5: 161-165, illus. R-14*
(Winter foliage coloration of 1- to 3-year-old jack pine nursery stock from 29 seed origins in the Lake States was strongly correlated with latitude and number of degree days over 50° F. of seed origin localities.)

Zasada, Zigmond A.
1958. APPLYING FOREST TREE IMPROVEMENT PRACTICES IN SILVICULTURE. In Third Lake States Forest Tree Improvement Conf. Proc., U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 58: 15-18. SP-58*
(Although a good rate of growth can be maintained under several methods of cutting and over a wide range of stocking, little is known as to what is happening to the stands genetically.

Order No.

The geneticist must make his information on distinguishing good and poor trees available in simple language so the forest manager can use it.)

SHELTERBELTS

Dickerman, M. B.
1960. HISTORY AND PROBLEMS OF TREE PLANTING IN THE NORTHERN PLAINS. U. S. Forest Serv., Lake States Forest Expt. Sta. (no series), 9 pp. (Processed.) R-202

(Reviews tree planting efforts from pioneer days to the present. Discusses the most significant research findings, and points out some of the more obvious research needs.)

Stoeckler /Stoeckeler/, J. H.
1958. TREES PAY FARM BENEFITS. Conserv. Volunteer 21 (123): 26-31, illus. R-110

(Cites the value of field shelterbelts in reducing wind erosion, trapping snow, and reducing evaporation.)

SOILS AND WATER

Bay, Roger R.
1958. OCCURRENCE AND DEPTH OF FROZEN SOIL. Jour. Soil and Water Conserv. 13: 232-233, illus. R-111*

(Forest cover is beneficial in reducing the formation of concrete frost. A mixed white pine-hardwood stand and an aspen stand were more effective in reducing frost formation than was a dense balsam fir stand.)

Bay, Roger R.
1958. FOREST TYPE AFFECTS SNOW PACK. Jour. Soil and Water Conserv. 13: 129-130, illus. R-112*

(Snow depth and water content measurements were collected in a red pine plantation and an adjacent brushy aspen area. During the spring melt period more snow was present under the plantation canopy and snow melt was prolonged.)

Bay, Roger R.
1958. CUTTING METHODS AFFECT SNOW ACCUMULATION AND MELT IN BLACK SPRUCE STANDS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 523, 2 pp., illus. (Processed.) TN-523*

(Data on snow depth and water content indicated that cutting narrow east-west strips in black spruce resulted in higher total accumulation of snow and a reduced rate of melt in the spring. Large open areas lost their snow most rapidly.)

Bay, Roger R.
1959. AN INEXPENSIVE SOIL TUBE JACK. Soil Sci. 88: 303-304, illus. R-154*

(An automobile bumper jack was modified to use as a puller jack for extracting soil sampling tubes. The modified jack cost about one-fifth the price of a commercial puller jack and soil tube grip.)

Order No.

Bay, Roger R.
1960. SOIL FREEZING OBSERVATIONS AFTER CHANGES IN FOREST COVER. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 576, 2 pp. (Processed.) TN-576*

(Two years' observations indicate that concrete frost penetrates deeper and remains longer in the spring under a 20-year-old red pine plantation than under an adjacent area of aspen-brush. Variations in type and depth of the humus and the depth of the snowpack help explain the differences in frost penetration.)

Curtis, Willie R.
1960. MOISTURE STORAGE BY LEAF LITTER. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 577, 2 pp. (Processed.) TN-577*

(Galvanized tanks were placed under boxes that contained 2 to 3 inches of hardwood or pine litter. The rain that filtered through the litter was measured by weighing the tanks. Both kinds of litter held about the same amount of rainfall: 34.2 percent for hardwoods; 33.2 percent for pine. The amount retained varied from 93.7 percent for small rains to 11 percent for rains greater than 1 inch.)

Curtis, Willie R.
1960. AN AUTOMATIC TRIGGER DEVICE FOR USE ON FW-1 WATER LEVEL RECORDERS. Jour. Forestry 58: 819-821, illus. R-203*

(Explains construction and operation of a time-saving trigger device used in conjunction with water-level recording on ephemeral streams. During no-flow periods the clock is kept from running by application of back pressure. When flow occurs, movement of float activates release mechanism and clock begins to run.)

Della-Bianca, Lino, and Dils, Robert E.
1960. SOME EFFECTS OF STAND DENSITY IN A RED PINE PLANTATION ON SOIL MOISTURE, SOIL TEMPERATURE, AND RADIAL GROWTH. Jour. Forestry 58: 373-377, illus. R-204*

(Decreasing stand basal area rendered an initial supply of soil moisture available over a given period of time for the remaining trees. This temporary increase in soil moisture in the A horizon contributed to increased growth in thinned stands.)

Dils, Robert E.
1957. WATERSHED MANAGEMENT RESEARCH NEEDS IN THE FORESTS OF THE LAKE STATES. Mich. State Univ. Agr. Expt. Sta. Spec. Bul. 416, 35 pp., illus. R-59*

(This bulletin provides a survey of watershed management research needs in the northern forest area and the Driftless Area of the Lake States. It describes the water resources and requirements and the problems in watershed management. Background information includes climate, topography and geology, soils, and land use.)

Dils, Robert E., and Arend, John L.
1956. SNOW ACCUMULATION UNDER RED PINE OF DIFFERENT STAND DENSITIES IN LOWER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 460, 2 pp., illus. (Processed.) TN-460*

(Measurements show that depth of snow accumulation decreased as stand density increased; the intercepted snow was lost by evaporation and sublimation.)

Order No.

Godman, R. M.
1959. ARE WATER TABLE LEVELS AN IMPORTANT FACTOR IN THE MANAGEMENT OF YELLOW BIRCH? Mich. Acad. Sci., Arts, and Letters Papers 44: 183-190, illus. — R-155*

(Discusses the relationship of ground water levels with cover type association, and their influence on regeneration and diameter growth of yellow birch in Upper Michigan. Considers extended period of high water levels as a factor in the extensive top-dying of yellow birch in 1954.)

Sartz, Richard S.
1959. FORESTS AND WATER: A TALE OF TWO WATERSHEDS. Wis. Acad. Rev. 6: 55-58, illus. (Processed.) — R-156

(How forests minimize floods and erosion is told by describing what happens when both a forested and a bare watershed are hit by a heavy rain.)

Sartz, Richard S.
1960. FORESTS AND EROSION IN THE DRIFTLESS AREA. Wis. Conserv. Bul. 25 (3): 21-24, illus. — R-205

(Explains how geologic erosion shaped the land forms of the Driftless Area and how man has triggered a new cycle of erosion through overdevelopment of the land for agriculture. A study of wooded watersheds showed no accelerated erosion.)

Stoeckeler, J. H.
1959. TRAMPLING BY LIVESTOCK DRASTICALLY REDUCES INFILTRATION RATE OF SOIL IN OAK AND PINE WOODS IN SOUTHWESTERN WISCONSIN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 556, 2 pp., illus. (Processed.) — TN-556*

(Livestock trampling reduced infiltration by 93 percent as measured by 3-inch cylinders.)

Stoeckeler, J. H., and Curtis, Willie R.
1960. SOIL MOISTURE REGIME IN SOUTHWESTERN WISCONSIN AS AFFECTED BY ASPECT AND FOREST TYPE. Jour. Forestry 58: 892-896, illus. — R-206*

(Gives results of soil moisture on a transect across a valley, from ridge to ridge, showing markedly better moisture conditions on north- versus south-facing slopes. Tree growth in pine plantations was 3.5 times better than in oak in south-facing slopes.)

Stoeckeler, J. H., and Thames, J. L.
1958. THE LAKE STATES PENETROMETER FOR MEASURING DEPTH OF SOIL FREEZING. Soil Sci. 85: 47-50, illus. — R-113

(A frost penetrometer is described consisting of a steel rod calibrated in inches and a dead-weighted driving hammer. It is useful in determining depth of soil freezing to a depth of 12 to 15 inches.)

Stoeckeler, Joseph H., and Voskuil, Glenn J.
1959. WATER TEMPERATURE REDUCTION IN SHORTENED SPRING CHANNELS OF SOUTHWESTERN WISCONSIN TROUT STREAMS. Amer. Fisheries Soc. Trans. 88: 286-288, illus. — R-157*

(Late afternoon summer water temperatures at the mouth of a spring channel on a trout stream near LaCrosse in southwestern Wisconsin were reduced by 10° to 11° F. by shortening the channel by 67 percent and routing the water through a willow-shaded location.)

Order No.

Stoeckeler, J. H., and Weitzman, Sidney.
1960. INFILTRATION RATES IN FROZEN SOILS IN NORTHERN MINNESOTA. Soil Sci. Soc. Amer. Proc. 24: 137-139. — R-207*
(Concretely frozen silt loam soils showed 0.09 inch of infiltration per hour, while sands of similar frost type showed 0.47 inch. A porous-concrete frost type was found in loamy sands; in these soils infiltration amounts were 2.19 inches for the porous-concrete frost, 3.97 inches in partly frozen soils, and 13.22 inches in unfrozen soils.)

Striffler, W. D.
1959. EFFECTS OF FOREST COVER ON SOIL FREEZING IN NORTHERN LOWER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 76, 16 pp., illus. (Processed.) — SP-76*
(A study of the type, depth, and duration of soil frost under open and closed red pine plantations and scrub oak, and northern hardwood forest types with respect to snow depth and humus type.)

Striffler, W. D.
1960. FORESTS HELP WATER SUPPLY. Mich. Farmer 233 (4): 52-53, illus. — R-208
(Of Michigan's annual precipitation, 15 to 30 percent occurs as snow. Water received as snow forms a major portion of the water available for recharge to streams and ground water. The influence of various major forest types upon the accumulation and melt of snow and its significance are discussed.)

Striffler, W. D.
1960. STREAMBANK STABILIZATION IN MICHIGAN--A SURVEY. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 84, 14 pp., illus. (Processed.) — SP-84*
(A survey of 113 untreated and 115 treated streambanks in four Michigan watersheds demonstrates the stabilizing influence of rock riprap and vegetation upon erosion from streambanks.)

Strothmann, R. O.
1960. EVALUATING THE GROWTH POTENTIAL OF ASPEN LANDS IN NORTHERN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 86, 20 pp., illus. (Processed.) — SP-86*
(Presents a site prediction scheme for quaking aspen in northern Minnesota that would require only simple field techniques readily applicable by practicing foresters. The scheme, based on four soil factors and three topographic factors, can serve as a general useful guide but has some limitations.)

Thames, John L. and Swensen, Edmond I.
1957. PROPERTIES OF 160 SOILS OF FOUR NORTH CENTRAL STATES. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 38, 15 pp., illus. (Processed.) — SP-38*
(Characterizes the individual sample sites and summarizes the information on properties of soils at 160 sites in Iowa, Minnesota, Wisconsin and Illinois.)

Urie, Dean H.
1959. PATTERN OF SOIL MOISTURE DEPLETION VARIES BETWEEN RED PINE AND OAK STANDS IN MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 564, 2 pp., illus. (Processed.) — TN-564*

Order No.

(Depletion of soil moisture by 25-year-old red pine plantations exceeded that under native oak forests during the early part of the growing season. After full leaf development of the oaks, the level of soil moisture under them was depleted rapidly until soils under both cover types were near wilting point by early August. Total evapotranspiration for both cover types was similar.)

Voigt, G. K., Heinselman, M. L., and Zasada, Z. A.
1957. EFFECT OF SOIL CHARACTERISTICS ON THE GROWTH OF QUAKING ASPEN IN NORTHERN MINNESOTA. Soil Sci. Soc. Amer. Proc. 21: 649-652, illus. R-60

(Aspen soils in northern Minnesota were found to have a wide range of replaceable bases and other fertility factors. The average annual growth of aspen on soils with high levels of calcium, magnesium, potassium, and nitrogen was over four times greater than that on soils with low fertility. Foliar analysis showed a close relation between soil fertility and the presence of calcium, magnesium, and potassium in aspen leaves.)

Weitzman, Sidney
1957. PROBLEMS OF WATERSHED MANAGEMENT. The Conserv. Volunteer 20 (115): 8-13, illus. R-61

(Reports the establishment of a watershed management research program in Minnesota. Outlines some of the present water problems in the area and discusses factors which will create an increased demand in the future.)

Weitzman, Sidney
1957. THERE'S WATER IN THE FORESTS. The Conserv. Volunteer 20 (116): 18-22, illus. R-62

(Gives some facts about the interrelations of forests and water. Discusses the management of the forests for multiple uses, including watershed protection. Outlines the research program planned for Minnesota, which is designed to help solve existing problems.)

Weitzman, Sidney, and Bay, Roger R.
1958. WINTER SNOW AND WATER SUPPLY. Conserv. Volunteer 21 (126): 45-48, illus. R-114

(Reports on snow accumulation and melt under different cover conditions. A pine plantation delayed snow melt longer in the spring than did an adjacent aspen stand. Observations in natural stands showed a mixed pine-hardwood cover most effective. Snow disappeared most rapidly from open land.)

Weitzman, Sidney, and Bay, Roger R.
1959. SNOW BEHAVIOR IN FORESTS OF NORTHERN MINNESOTA AND ITS MANAGEMENT IMPLICATIONS. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 69, 18 pp., illus. (Processed.) SP-69*

(Snow accumulation and melt patterns were observed under red pine, aspen, and black spruce stands. The effects of timber management practices such as thinning, cutting methods, type conversion, and plantation management are discussed in terms of snow behavior.)

FIRE

Order No.

Dickerman, M. B.

1958. FIRE RESEARCH IN THE LAKE STATES. U. S. Forest Serv., R-9 Fire Meeting Proc. (1958): 17-21 and 6 charts. (Mimeo.) — R-115

(Discusses fire research and its relation to other forest research in the Lake States. Points out that a greater fire research effort is needed to aid in protecting the expanding acreage of coniferous plantings, to aid in making our protection organizations more effective, and to minimize hazards related to forest production and allow appropriate use of fire for silvicultural purposes.)

Gaylord, George, and Roe, E. I.

1958. SODIUM BORATES SHOW PROMISE FOR GRASS CONTROL. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 515, 2 pp. (Processed.) — TN-515*

(A commercial mixture of sodium tetraborates and chlorophenyl dimethyl urea, known as Ureabor, applied to upland sandy soil at the rate of 650 pounds per acre killed all the grass and other vegetation and kept the area bare for 2 years.)

Gaylord, George, and Roe, E. I.

1958. TESTS OF SOME CHEMICALS FOR GRASS CONTROL ON FIREBREAKS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 516, 2 pp. (Processed.) — TN-516*

(Ureabor, a mixture of sodium tetraborates and chlorophenyl dimethyl urea, proved most effective of four chemicals, each tested at two levels, in not only killing grass and herbs but in keeping these from re-invading fire breaks on upland loamy sand.)

LaMois, Loyd M.

1956. PINE PLANTATIONS OFFER FIRE PROTECTION PROBLEMS IN LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 462, 2 pp. (Processed.) — TN-462*

(Compares occurrence, average size, and per-acre damage of fires in pine types to other stocked timber types in the region, and relates the information to problems of plantation protection.)

LaMois, L. M.

1957. FIRE HISTORY AND THE PRESENT SITUATION IN NORTHERN WOODS. Timber Producer 13(4): 16-18, illus. — R-63

(Character and extent of past losses due to fire were caused mainly by timber harvest methods, with subsequent large and uncontrollable fires. Future losses should be reduced through less drastic cutting methods and better utilization.)

LaMois, Loyd.

1958. TREE FARMS NEED FIRE PROTECTION. Forest and Farm 1 (1): 12-13. — R-116

(Points out that fire invariably does some damage to forest land and that the potential for serious damage warrants protective measures, even on a farm-scale forest. The article mentions a few things that can be done to minimize chances of loss from fire.)

Order No.

LaMois, Loyd.
1958. FIRE FUELS IN RED PINE PLANTATIONS. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 68, 19 pp., illus. (Processed.) SP-68*
(Describes the quantities, by weight, of fire fuels in red pine plantations as represented by grass and herbaceous ground cover, dead branches, and needle litter. How each is affected by stand density, site quality, and age.)

LaMois, Loyd.
1960. 1894-FOREST FIRE FIGHTING-1959. Minn. Conserv. Volunteer 23 (134): 10-14, illus. R-209
(A brief account in popular style of advances in forest fire fighting techniques in Minnesota.)

McCulley, Robert D.
1958. USE OF FIRE IN FOREST MANAGEMENT. U. S. Forest Serv., R-9 Fire Meeting Proc. (1958): 43-49. (Mimeo.) R-117
(Outlines some of the general relationships between fire and timber production, discusses some of the principles involved, illustrates them with examples from various parts of the country, and draws some inferences about the use of fire in the Lake States.)

FOREST INSECTS

Annual Situation Reports (cooperative reports on the insect situation during a given year, based on surveys conducted by Federal, State, and private agencies).

Anderson, Gerald W., and Schmiege, Donald C.
1959. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1958. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 70, 18 pp., illus. (Processed.) SP-70*

Beckwith, L. C., and Anderson, R. L.
1956. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1956. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 42, 26 pp., illus. (Processed.) SP-42

Beckwith, L. C., and Ewan, H. G.
1956. THE FOREST INSECT SITUATION, LAKE STATES, 1955. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 35, 15 pp., illus. (Processed.) SP-35

Schmiege, Donald C., and Anderson R. L.
1958. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1957. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 60, 22 pp., illus. (Processed.) SP-60*

Schmiege, Donald C., and Anderson, Gerald W.
1960. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1959. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 79, 18 pp., illus. (Processed.) SP-79*

Order No.

Forest Pest Leaflets (brief accounts of the life history and habits of an insect, with suggestions for its control and for preventing damage).

Batzer, Harold O., and Waters, William E.
1956. FOREST TENT CATERPILLAR. U. S. Forest Serv., Forest Pest Leaflet 9, 4 pp., illus. FPL-9*

Bean, James L.
1956. RED PINE SCALE. U. S. Forest Serv., Forest Pest Leaflet 10, 4 pp., illus. *Also* Timber Prod. Bul. (Duluth, Minn.) 12 (6): 14. FPL-10*

Drooz, Arnold T.
1956. THE LARCH SAWFLY. U. S. Forest Serv., Forest Pest Leaflet 8, 4 pp., illus. FPL-8*

Ewan, H. G.
1957. THE JACK-PINE SAWFLY. U. S. Forest Serv., Forest Pest Leaflet 17, 4 pp., illus. FPL-17*

Jaynes, H. A., and MacAloney, H. J.
1958. THE WHITE-PINE WEEVIL. U. S. Forest Serv., Forest Pest Leaflet 21, 7 pp., illus. FPL-21*

MacAloney, H. J.
1957. THE RED-HEADED PINE SAWFLY. U. S. Forest Serv., Forest Pest Leaflet 14, 4 pp., illus. *Also* Timber Prod. Assoc. Monthly Bul. 12 (9): 14. FPL-14*

MacAloney, Harvey J., and Drooz, Arnold T.
1956. THE JACK-PINE BUDWORM. U. S. Forest Serv., Forest Pest Leaflet 7, 4 pp., illus. FPL-7*

Schmiege, D. C.
1959. THE PINE ROOT COLLAR WEEVIL. U. S. Forest Serv., Forest Pest Leaflet 39, 4 pp., illus. FPL-39*

Other Reports on Insects

Batzer, Harold O.
1956. TIP AND WOOD FEEDING INSECTS OF MINNESOTA. *In* Abstract of Tree Protection Short Course, Univ. of Minn. Inst. of Agr., pp. 21-26. (Processed.) R-15
(A brief resume of tip- and wood-feeding insects attacking ornamentals and foundation plantings, and methods of control.)

Batzer, Harold O.
1960. MINED BUDS, A HIBERNATION SITE FOR SPRUCE BUDWORM. Jour. Econ. Ent. 53: 684-685, illus. R-210*
(Hollowed-out vegetative buds of balsam fir caused by early season feeding were found to be used by spruce budworm larvae for hibernation sites in areas where balsam had not yet produced staminate flowers. These buds bear a striking resemblance to the empty cup-like staminate flower bracts found on mature balsam, which are so favorable for overwintering sites.)

Order No.

Bean, J. L.
1956. INSECTS DEFOLIATING CONIFERS IN MINNESOTA. In Abstract of Tree Protection Short Course, Univ. of Minn. Inst. of Agr. pp. 27-30. (Processed.) R-16

(A brief resume of defoliating insects attacking coniferous ornamentals and foundation plantings, and methods of control.)

Bean, J. L.
1957. SPRUCE BUDWORM RESEARCH AND MANAGEMENT RECOMMENDATIONS. Ent. Soc. Amer., 12th Ann. Meeting No. Central Branch Proc. 1957: 14-15. (Processed.) R-64

(Outlines a research program initiated by the Station to investigate the biology and ecology of the spruce budworm in the Lake States and to develop management practices to reduce losses by this insect.)

Bean, James L.
1957. SPRUCE BUDWORM IS A KILLER. Conserv. Volunteer 20 (116): 34-38. R-65

(A nontechnical presentation of the present spruce budworm outbreak in the United States, with special reference to the problem in Minnesota.)

Bean, J. L.
1958. THE USE OF LARVAEVORID MAGGOT DROP IN MEASURING TRENDS IN SPRUCE BUDWORM POPULATIONS. Ent. Soc. Amer. Annals 51 (4): 400-403, illus. R-118*

(Presents a sampling method whereby an estimate of significant differences between budworm populations can be determined for any 2 years within the same area and also for any two areas during the same period.)

Bean, James L.
1959. FRASS SIZE AS AN INDICATOR OF SPRUCE BUDWORM LARVAL INSTARS. Ent. Soc. Amer. Annals 52: 605-608, illus. R-158*

(Frass size can be used effectively to classify larval instars. The frass collected in the field can be used as an index of the percent of larvae in each instar at the time the collection is made.)

Bean, J. L., and Batzer, H. O.
1956. A SPRUCE BUDWORM RISK-RATING FOR THE SPRUCE-FIR TYPES IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 453, 2 pp. (Processed.) TN-453*

(Presents a method for rating the susceptibility of a spruce-fir stand to budworm damage. Such factors as age, density, composition, area, and vigor were employed in developing the risk-rating tables.)

Bean, J. L., and Batzer, H. O.
1957. MEAN HEAD WIDTH FOR SPRUCE BUDWORM LARVAL INSTARS IN MINNESOTA AND ASSOCIATED DATA. Jour. Econ. Ent. 50: 499. R-66*

(Presents data on larval head capsule widths that are useful for separating the different larval stages. Such information is essential in properly timing aerial spraying operations.)

FOREST INSECTS

Order No.

Bean, James L., and Graeber, Hart
1957. SPRUCE BUDWORM INCREASING IN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 479, 2 pp., illus. (Processed.) TN-479*

(A brief report on the spruce budworm situation in Minnesota as determined from aerial and ground surveys.)

Beckwith, L. C.
1956. SUCKING INSECTS OF MINNESOTA. *In* Abstract of Tree Protection Short Course, Univ. of Minn. Inst. of Agr., pp. 17-20. (Processed.) R-17

(A brief resume of sucking insects attacking ornamentals and foundation plantings, and method of control.)

Beckwith, L. C.
1957. JACK-PINE BUDWORM SITUATION IN THE LAKE STATES. Ent. Soc. Amer., 12th Ann. Meeting No. Central Branch Proc. 1957: 12. (Processed.) R-67

(Heavy feeding by this insect occurred in the Lake States in 1955 and 1956. Surveys in 1956 indicated the probable need for aerial spraying with DDT on more than 200,000 acres of jack pine type in Wisconsin.)

Beckwith, L. C.
1957. TAMARACK MORTALITY DUE TO LARCH SAWFLY DEFOLIATION INCREASES IN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 487, 2 pp. (Processed.) TN-487*

(Tamarack mortality due to larch sawfly defoliation has become apparent in the better tamarack sites in north central Minnesota. Much of this mortality occurred in the 2-inch diameter class.)

Beckwith, L. C.
1957. WEATHER STATION RECORDS NOT AN ACCURATE GUIDE TO TEMPERATURES LETHAL TO THE SHOOT MOTH. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 508, 2 pp., illus. (Processed.) TN-508*

(Temperatures in plantations near Lake Michigan were consistently higher than temperatures registered at official weather station; they were never near the lethal range during the course of the study.)

Beckwith, L. C., and Drooz, A. T.
1956. TAMARACK MORTALITY IN MINNESOTA DUE TO LARCH SAWFLY OUTBREAK. Jour. Forestry 54: 268-269. R-18*

(Brings together information on initial tamarack mortality due to larch sawfly defoliation in the current outbreak.)

Benjamin, D. M., and Beckwith, L. C.
1956. AN EVALUATION OF SARATOGA SPITTLEBUG POPULATION ESTIMATION TECHNIQUES. Ent. Soc. Amer. No. Central Branch Proc., 11th Ann. Meeting, pp. 19-20. R-19

(Describes a refinement in survey procedure that could be used in nymphal surveys of the Saratoga spittlebug. The method could be applied to surveys of other insects exhibiting the same general life cycle.)

Order No.

Drooz, A. T.
1957. SPRAY CHAMBER INSECTICIDE TESTS ON THE LARCH SAWFLY. Canad. Ent. 89: 183-187, illus. R-68*

(BHC, malathion, and DDT were tested in a spray chamber to determine the effectiveness of each against the larvae of the larch sawfly. At the concentrations and dosages, DDT failed; BHC and malathion gave satisfactory results, the former being more potent against 4th- and early 5th-instar larvae.)

Drooz, A. T.
1957. THE IMPORTANCE OF *MESOLEIUS TENTHREDINUS* MOR., A PARASITE OF THE LARCH SAWFLY, IN NEW YORK STATE. Jour. Econ. Ent. 50: 212. R-69

(Parasitism amounted to 56 percent of the 95 live larvae in the collection. Immunity reaction is not present in the New York sawfly according to these observations.)

Drooz, A. T.
1960. THE LARCH SAWFLY: ITS BIOLOGY AND CONTROL. U. S. Dept. Agr. Tech. Bul. 1212, 52 pp., illus. TB-1212*

(A full account of the life history and habits of an important insect attacking tamarack. Natural control factors and direct control are discussed in detail.)

Drooz, A. T., and Benjamin, D. M.
1956. PARASITES FROM TWO JACK-PINE BUDWORM OUTBREAKS ON THE UPPER PENINSULA OF MICHIGAN. Jour. Econ. Ent. 49: 412-413. R-20*

(An outbreak of the jack-pine budworm (*Choristoneura pinus* Free.), covering about 7,200 acres in Upper Michigan, was investigated for parasites of the larvae and pupae in 1953. Highest larval parasitism was effected by *Aplomya caesar* (Ald.), 4 percent. Highest pupal parasitism was caused by *Itoplectis conquisitor* (Say), 21 percent.)

Ewan, Herbert G.
1956. A METHOD FOR MEASURING THE INSECT POPULATION ON TREES 6 TO 12 FEET TALL. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 455, 1 p., illus. (Processed.) TN-455*

(A description of a large plastic tent which can be dropped over a tree and filled with an insecticide to determine the insect population.)

Ewan, Herbert G.
1958. THE USE OF THE HOST SIZE AND DENSITY FACTOR IN APPRAISING THE DAMAGE POTENTIAL OF A PLANTATION INSECT. Tenth Intl. Congress Ent. Proc. 4: 363-367, illus. R-119*

(An appraisal technique for predicting Saratoga spittlebug damage in red pine plantations. The insect population, measured during the nymphal stage on a 1/10-milacre basis, is adjusted to a tree size and density factor to estimate the damage potential.)

Ewan, H. G.
1958. SOME EFFECTS OF TEMPERATURE EXTREMES ON SARATOGA SPITTLEBUG POPULATIONS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 519, 2 pp., illus. (Processed.) TN-519*

(Hot, dry weather in 1956 and late spring frosts in 1957 sharply reduced nymphal populations in some areas in Wisconsin and Upper Michigan and eliminated need for control operations.)

Order No.

Ewan, Herbert G.
1960. THE POPLAR BORER IN RELATION TO ASPEN STOCKING. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 580, 2 pp., illus. (Processed.) TN-580*

(A discussion of the trends in infestation on 145 1/10-acre plots in aspen stands of varied stocking levels.)

Flink, Paul R., and Miller, William E.
1960. PLANTATION ENEMY NO. 1: THE EUROPEAN PINE SHOOT MOTH. Northeast. Logger 8 (7): 20, 21, 50, 51; illus. R-211

(Reviews status of the European pine shoot moth problem as well as research being conducted in Michigan on the shoot moth.)

Godwin, Paul A., and Bean, James L.
1956. PREDICTING EMERGENCE OF THE WHITE-PINE WEEVIL FROM HIBERNATION. Forest Sci. 2: 187-189, illus. R-21*

(A reasonably accurate and usable basis for estimating the degree and rate of weevil emergence in the spring is presented. Using 40° F. air temperature as the threshold of upward movement, cumulative degrees between 6 a.m. and 6 p.m. were closely correlated with the percent of weevil emergence.)

Haynes, Dean L.
1959. DORSAL CONTACT TOXICITY OF SIX INSECTICIDES TO WINTERING LARVAE OF THE EUROPEAN PINE SHOOT MOTH. Jour. Econ. Ent. 52: 588-590. R-159*

(Six organic insecticides were tested against the overwintering larvae of the European pine shoot moth. No significant mortality was obtained with DDT, chlordane, or BHC at any concentrations used. Malathion, Thimet O, O-diethyl S-(ethylthio) methyl phosphorodithioate, and dimethoate produced mortality at all concentrations used.)

Heikkenen, Herman John.
1960. THE IDENTIFICATION AND DATING OF PAST ATTACKS OF THE EUROPEAN PINE SHOOT MOTH ON RED PINE. Jour. Forestry 58: 380-384, illus. R-212*

(By dating past shoot moth attacks, the length of an infestation can be determined. Population buildups and stand damage can be estimated, and infestations on different sites compared and the feasibility of control measures and timber stand improvement practices determined.)

Heikkenen, H. J., and Miller, W. E.
1960. EUROPEAN PINE SHOOT MOTH DAMAGE AS RELATED TO RED PINE GROWTH. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 83, 12 pp., illus. (Processed.) SP-83*

(Contrary to earlier literature implications, European pine shoot moth populations do not always build up and cause damage in young red pine plantings. Also, high and damaging insect populations do not always persist. Red pine growing 15 inches or more per year in height were found to resist attack.)

Heller, R. C., Bean, J. L., and Knight, F. B.
1959. AERIAL SURVEYS OF BLACK HILLS BEETLE INFESTATIONS. U. S. Forest Serv., Rocky Mtn. Forest and Range Expt. Sta., Sta. Paper 46, 8 pp., illus. (Processed.) R-160

(Presents a method for surveying Black Hills beetle infestations from the air. Estimates of the number of trees killed the

Order No.

preceding year can be obtained by visual means or color photograph. The ratio between previously attacked and currently infested trees is obtained from ground checks.)

MacAloney, H. J.
1957. THE SPRUCE BUDWORM--A DEVASTATING FOREST PEST. Ent. Soc. Amer., 12th Ann. Meeting, No. Central Branch Proc. 1957: 13. (Processed.) R-70

(Historical review of spruce budworm epidemics in Canada and the United States since 1770, and a brief discussion of the outbreaks in the Lake States and adjacent Canada since 1910.)

MacAloney, H. J.
1957. FOREST INSECTS IN THE NORTHERN HARDWOOD TYPE. The Timber Producer 13 (6): 6-7. R-71

(A brief statement covering the important insects which can cause tree mortality, growth loss, and lumber degrade in the important tree species in the northern hardwood type in the Lake States.)

Miller, William E.
1959. SPREAD OF FOREST LEPIDOPTERA. Ent. Soc. Amer., No. Central Branch Proc. 14: 11 (Abst.) (Processed.) R-161

(Reviews the different spreading processes observed among forest Lepidoptera, especially dispersal by convectional currents associated with frontal weather.)

Miller, William E.
1959. PRELIMINARY STUDY OF EUROPEAN PINE SHOOT MOTH PARASITISM IN LOWER MICHIGAN. Jour. Econ. Ent. 52: 768-769. R-162*

(Parasitism of the European pine shoot moth by native parasites in Michigan is shown to be slight. It would probably be worthwhile to import parasites from Europe, where the number of different kinds of parasites affecting the shoot moth is greater as is their importance in suppressing this insect.)

Miller, William E.
1959. A UNIQUE NEW NORTH AMERICAN SPECIES OF PINE CONE FEEDING LASPEYRESIA RELATED TO L. INGENS HEINRICH. Fla. Entomologist 42 (3): 131-134, illus. R-163*

(A brightly colored pine cone moth new to science is described and named. It affects cones of several pine species in the Southeast.)

Miller, William E.
1960. DISCOVERY IN MICHIGAN OF ORGILUS OBSCURATOR (NEES), A FOREIGN PARASITE OF THE EUROPEAN PINE SHOOT MOTH. Jour. Econ. Ent. 53: 318. R-213

(The finding of this parasite affecting the shoot moth in southeastern Michigan suggests that it spread from Ontario where it had been released in previous years. Such natural spread indicates that the parasite is adapted to Michigan and that attempts to use it to suppress the shoot moth should be stepped up.)

Miller, William E.
1960. UNUSUAL OCCURRENCE OF THE VIRGINIA PITCH-NODULE MOTH, PETROVA WENZELI (KEARFOTT), IN CANADA (LEPIDOPTERA: OLETHREUTIDAE). Canad. Ent. 92: 879. R-214*

Order No.

(A few specimens of *Petrova wenzeli* were discovered among much larger numbers of *P. albicapitana* specimens obtained by the Canadian Forest Insect Survey at several Canadian localities. The normal range of *P. wenzeli* is in the middle eastern United States. How the insect came to be in Canada is not known.)

Miller, William E.
1960. THE EUROPEAN PINE SHOOT MOTH: RELATIONSHIP BETWEEN PROPORTION OF TREES INFESTED AND NUMBER OF INSECTS PER TREE. Jour. Forestry 58: 647-648, illus. R-215*

(Up to about 7 insects per tree, there is an exponential relationship between number of insects per tree and percentage of trees infested in shoot moth-infested pine plantations in the spring. At low insect population densities, therefore, the percentage of trees infested can be used as an index of insect population level, and laborious counting of insects on trees avoided.)

Miller, William E., and Arend, John L.
1960. EUROPEAN PINE SHOOT MOTH DAMAGE REDUCED ON SHEARED CHRISTMAS TREES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 592, 2 pp. (Processed.) TN-592*

(Removing the buds on new shoots of red, Scotch, and Austrian pines during late June, mid-July, and early August prevented infestation of 86 to 100 percent of the second crop of buds. Although such operations largely prevent annual damage by shoot moth on shoots treated, the treatment does not prevent the population from building up the following year.)

Miller, William E., and Haynes, Dean L.
1958. TIMING DDT SPRAYS IN THE SPRING FOR EUROPEAN PINE SHOOT MOTH CONTROL. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 542, 1 p. (Processed.) TN-542*

(Good control was obtained with sprays containing 2 pounds of actual DDT per 100 gallons of water applied over a period coinciding with the month of April. This period included the 2 weeks before and 2 weeks after the beginning of external larval activity.)

Miller, William E., and Haynes, Dean L.
1958. CONTROL OF THE EUROPEAN PINE SHOOT MOTH WITH CONCENTRATED DDT SPRAYS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 543, 2 pp., illus. (Processed.) TN-543*

(Good control of the shoot moth was obtained by using airblast equipment to apply 2 1/2 percent DDT at 40 gallons of spray per acre. This type equipment generates a high velocity blast of air to carry spray, thereby making it possible to reduce the quantity of liquid in the spray mixture.)

Miller, William E., and Heikkenen, H. J.
1959. THE RELATIVE SUSCEPTIBILITY OF EIGHT PINE SPECIES TO EUROPEAN PINE SHOOT MOTH ATTACK IN MICHIGAN. Jour. Forestry 57: 912-914, illus. R-164*

(Ratios of number of insects to number of shoots on each of eight pine species were compared. Virginia, pitch, jack, and eastern white pine had low ratios and were thus rated as slightly susceptible. Ponderosa, Austrian, and Scotch pine were in the middle. Red pine had the highest ratio and was therefore rated high in susceptibility.)

Order No.

Miller, William E., and Neiswander, Ralph B.
1956. THE PITCH TWIG MOTH AND ITS OCCURRENCE IN OHIO. Ohio Agr. Expt. Sta. Res. Bul. 779, 24 pp., illus. R-22

(Discusses the geographic distribution, hosts, seasonal history, importance, and control of the pitch twig moth, *Petrova comstockiana* (Fernald).)

Schmiege, Donald C.
1958. THE PINE ROOT COLLAR WEEVIL--A THREAT TO YOUNG PINE STANDS. Ent. Soc. Amer., No. Central Branch 13: 13. (Processed.) R-120

(Widepsread damage in pine plantations has come to the attention of land managers as detailed surveys have become common. Life history, habits, and possibilities for control are discussed.)

Schmiege, Donald C.
1959. THE PINE ROOT COLLAR WEEVIL--WATCH FOR THIS PEST IN YOUR PINE PLANTATIONS. The Timber Producer 15 (1): 10-11, illus. R-165

(Describes damage, life history, and habits of an important plantation insect. Possibilities of preventing damage and controlling the insect are discussed.)

Talerico, Robert L.
1959. HOW TO SEPARATE DAMAGE BY THE EUROPEAN PINE SHOOT MOTH, THE ZIMMERMAN PINE MOTH, AND THE PITCH MASS BORER. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 571, 2 pp., illus. (Processed.) TN-571*

(Differentiates damage caused by these insects and gives a brief account of their life cycles.)

Waters, W. E., Heller, R. C., and Bean, J. L.
1958. Aerial appraisal of damage by the spruce budworm. Jour. Forestry 56: 269-276, illus. R-121

(Two methods--direct aerial observation and airphoto interpretation--are described and compared. Both methods were found to be useful, but accuracy depends greatly on the skill and experience of the observer making the damage estimates.)

Wilson, Louis F.
1959. BRANCH "TIP" SAMPLING FOR DETERMINING ABUNDANCE OF SPRUCE BUDWORM EGG MASSES. Jour. Econ. Ent. 52: 618-621, illus. R-166*

(The tips of shoots are separated from the branch, and egg masses are counted; the number on the tips must be increased by 16 percent to obtain the total number on the branch. Time saved by this technique ranges from 25 to 40 percent. The technique is not feasible for severely or completely defoliated branches.)

Wilson, Louis F.
1960. REDUCING PULPWOOD LOSSES FROM BORER ATTACKS BY SHADING CONVENTIONAL PULP PILES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 583, 2 pp., illus. (Processed.) TN-583*

(Woodborers, especially *Monochamus scutellatus*, caused the most damage to balsam fir logs in northern Minnesota. Piles in a clearing were much more vulnerable to attack than those in the shade. Pulp sticks that cannot be sprayed with insecticides or peeled should be protected from attack by piling in the shade or by a slash cover.)

Order No.

Wilson, Louis F., and Bean, James L.
1959. A MODIFIED OLFACTOMETER. Jour. Econ. Ent. 52: 621-624, illus. R-167*

(This olfactometer differs from previous models in the materials used and technical modifications. The insect test cage was made of lucite and shaped to eliminate dead air spaces and intermixing of air. The influent ports, valve system, and air-flow controls were also modified.)

FOREST DISEASE

Annual Situation Reports (cooperative reports on the disease situation during a given year, based on surveys conducted by Federal, State, and private agencies)

Anderson, Gerald W., and Schmiege, Donald C.
1959. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1958. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 70, 18 pp., illus. (Processed.) SP-70*

Beckwith, L. C., and Anderson, R. L.
1956. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1956. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 42, 26 pp., illus. (Processed.) SP-42

Schmiege, Donald C., and Anderson, R. L.
1958. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1957. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 60, 22 pp., illus. (Processed.) SP-60*

Schmiege, Donald C., and Anderson, Gerald W.
1960. THE FOREST INSECT AND DISEASE SITUATION, LAKE STATES, 1959. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 79, 18 pp., illus. (Processed.) SP-79*

Spread of Oak Wilt (a series of Technical Notes reporting the local and long-distance spread of oak wilt, 1955 to 1958)

Anderson, Gerald W., and Anderson, Ralph L.
1957. THE LOCAL SPREAD OF OAK WILT, 1955 TO 1956. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 480, 2 pp., illus. (Processed.) TN-480*

(Average radial spread per year of all established infection centers was 3.5 feet. The average for active centers was 6.5 feet.)

Anderson, Gerald W., and Anderson, Ralph L.
1957. OAK WILT--LONG-DISTANCE SPREAD, 1955 AND 1956. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 481, 2 pp., illus. (Processed.) TN-481*

(New infection centers were established at the rate of 1.7 centers in 1955 and 1.8 centers in 1956 per 100 acres of oak type.)

Anderson, Gerald W., and Anderson, Ralph L.
1958. THE LONG-DISTANCE SPREAD OF OAK WILT, 1955 TO 1957. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 520, 1 p. (Processed.) TN-520*

Order No.

(Establishment rate of new infection centers shows little variation over a 3-year period.)

Anderson, Gerald W., and Anderson, Ralph L.
1958. THE LOCAL SPREAD OF OAK WILT, 1955 TO 1957. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 521, 1 p. (Processed.) TN-521*

(Little change noted in enlargement rate of oak wilt infection centers from 1955 to 1957.)

Anderson, Gerald W., and Anderson, Ralph L.
1959. THE SPREAD OF OAK WILT, 1955 TO 1958. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 552, 1 p. (Processed.) TN-552*

(The 1958 rate of establishment of new oak wilt infection centers increased over that of the previous 3 years, while the radial spread on existing centers decreased.)

Top-Dying of Yellow Birch (a series of Technical Notes reporting progress of top-dying of yellow birch in Upper Michigan, 1954-1959)

Godman, R. M.
1956. PROGRESS OF TOP-DYING IN YELLOW BIRCH--UPPER MICHIGAN, 1954-55. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 444, 2 pp. (Processed.) TN-444

(Observation plots indicated a general crown deterioration, with some trees showing a trend toward recovery. Trees 15 inches and larger were the most seriously injured. The smaller trees appeared to be recovering more rapidly than the larger ones. Cut-over stands seem to be more seriously affected than virgin stands, but the evidence is not conclusive.)

Godman, R. M.
1958. CHANGES IN YELLOW BIRCH TOP-DYING, UPPER MICHIGAN, 1954-57. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 527, 2 pp., illus. (Processed.) TN-527*

(Top dying has continued to improve in virgin and moderately cut stands since the first year after it occurred. It increased in heavily cut stands until the third year where it has stabilized, with about 80 percent of the trees affected.)

Jacobs, Rodney D.
1960. TOP-DYING OF YELLOW BIRCH, UPPER MICHIGAN, 1955-1959. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 585, 2 pp., illus. (Processed.) TN-585*

(The top-dying of yellow birch in Upper Michigan, first reported in Technical Note 444, and later in Technical Note 527, had been gradually improving until 1959 when it became more widespread. The increase in top-dying was related to stand density, being more pronounced in the heavier cuttings.)

Other Reports on Diseases

Anderson, Gerald W.
1958. HYPOXYLON INFECTION NOT GREATLY INFLUENCED BY SEX OF ASPEN TREES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 535, 1 p. (Processed.) TN-535*

Order No.

(Discusses results of a survey in which 495 aspen trees were checked for sex and the presence or absence of Hypoxylon canker infection.)

Anderson, Gerald W.
1960. THE SEARCH FOR RESISTANCE TO CHESTNUT BLIGHT IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 578, 1 p. (Processed.) TN-578*

(A surprisingly large number of surviving chestnut trees have been reported in the Lake States. Some of these are producing viable seed. None of the trees examined so far have been infected by chestnut blight, but the probabilities are that they are escapees rather than resistant trees.)

Anderson, Gerald W., and Anderson, Neil A.
1958. CANKER ON THE ASPEN. Conserv. Volunteer 21 (121): 62-64, illus. R-122

(Describes the disease, its life cycle, and impact on aspen in the State. Some relationships between level of infection and stand characteristics are discussed.)

Anderson, Neil A.
1959. NEEDLE DROOP OF RED PINE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 549, 2 pp. (Processed.) TN-549*

(Eighty-nine percent of the sample trees observed in a north-central Minnesota red pine plantation were affected by needle droop. Dead terminal buds were present on 47 percent of this sample.)

Anderson, Neil A.
1960. STALACTIFORM RUST ON JACK PINE IN MINNESOTA. Forest Sci. 6: 40-41. R-216*

(Alternate host inoculation tests proved that a stem canker found on jack pine in Minnesota is caused by the rust _Cronartium coleosporioides_ (_Peridermium stalactiforme_). This is the first report of this rust east of the Great Plains in the United States.)

Anderson, Ralph L.
1956. HYPOXYLON CANKER OF ASPEN. U. S. Forest Serv., Forest Pest Leaflet 6, 3 pp., illus. FPL-6 *

(A brief resume of the present status of knowledge on the Hypoxylon canker problem.)

Anderson, Ralph L.
1957. FOREST DISEASES CAUSE SERIOUS LOSSES IN MERCHANTABLE NORTHERN HARDWOOD. The Timber Producer 13 (6 & 7): 10-11. R-72

(Growth loss in northern hardwoods caused by disease is estimated to be 65 percent as great as the net growth. Almost all of this estimated loss is caused by heart rots. Intensified management and utilization will materially reduce this loss.)

Anderson, Ralph L.
1958. THE MAPLE BLIGHT SITUATION. Timber Prod. Assn. Monthly Bul. 14 (3): 2. R-123

(Discusses the present status of research on the problem and the threat presented by the disease.)

FOREST DISEASE

Order No.

Anderson, Ralph L.
1959. MAPLE BLIGHT, A NEW PROBLEM IN THE LAKE STATES. Northeast. Logger 7 (11): 28-29, illus. R-168

(Severe mortality in maple stands of all size classes occurred in two areas in northeastern Wisconsin during 1957. Considerable effort is being expended to learn the cause of this mortality.)

Anderson, Ralph L., Joranson, Philip N., and Einspahr, Dean W.
1960. HYPOXYLON CANKER ON EUROPEAN ASPEN. Plant Dis. Rptr. 44: 132. R-217*

(Cankers caused by *Hypoxylon pruinatum* were found on *Populus tremula*. No previous reports of infection on this host in North America or western Europe were found. It has been reported in Russia. European aspen appears to be about as susceptible as the native *P. tremuloides*.)

Anderson, Ralph L., and Kaufert, Frank H.
1959. BROOMING RESPONSE OF BLACK SPRUCE TO DWARF MISTLETOE INFECTION. Forest Sci. 5: 356-364, illus. R-169*

(Describes the variations in host reaction that result in forming three types of witches'-brooms. Relates broom form to host vigor and age. Discusses evidence for growth reduction and mortality caused by the disease.)

Anderson, R. L., Skilling, D. D., and Clifford, E. D.
1956. NURSERY ROOT DISEASE CONTROL BY SOIL FUMIGATION. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 449, 1 p. (Processed.) TN-449*

(A summary of studies indicating that heavy application of formaldehyde or methyl bromide shows promise for controlling nursery root rot.)

Baxter, Dow V., and Hesterberg, Gene A.
1958. FUNGI ASSOCIATED WITH DECAY IN SUGAR MAPLE FOLLOWING LOGGING INJURY. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 528, 2 pp. (Processed.) TN-528*

(Decay in maple following logging injury is caused by fungi not considered of primary importance in causing defect in undisturbed forests.)

Beckwith, L. C., and Anderson, R. L.
1957. BOXELDER BLIGHT A PROBLEM IN THE NORTHERN PLAINS STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 482, 2 pp. (Processed.) TN-482*

(A blight of unknown cause is widespread on boxelder in North Dakota. Typical symptoms are small chlorotic leaves on the new shoots.)

Benzie, John W.
1958. A RED PINE PLANTATION PROBLEM IN UPPER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 524, 2 pp. (Processed.) TN-524*

(Describes the symptoms found in a red pine plantation with poor survival. Although dead branches were the most common, they were not associated with survival as were cankers and dead tops. Survival was related to seed source, especially in the younger plantations where mortality was greatest. Effort is now directed toward the identification of the cankers.)

Order No.

Godman, R. M.
1959. WINTER SUNSCALD OF YELLOW BIRCH. Jour. Forestry 57: 368-369, illus. R-170*
(Describes the position, extent, and development of stem injury to yellow birch saplings and poles in well-stocked northern hardwood stands. Associates a sudden temperature change on Feb. 16, 1948, as the probable time of occurrence.)

Guilkey, Paul C., Rudolph, Victor J., and Sheppard, George.
1958. EFFECTS OF SWEETFERN RUST ON THE GROWTH OF YOUNG JACK PINE IN NORTHERN LOWER MICHIGAN. Jour. Forestry 56: 900-903. R-124
(Height and diameter growth of trees with basal cankers in two 13-year-old plantations were not significantly different from disease-free trees. No mortality was attributable to the rust, the trees apparently being infested in the nursery. Unless wood-rotting fungi enter through the exposed dead wood, no significant loss in wood quality or usability is expected.)

Hesterberg, Gene A.
1957. LOGGING DAMAGE RISK CLASSIFICATION FOR SUGAR MAPLE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 488, 2 pp. (Processed.) TN-488*
(Indicates the decay risk for 10- and 20-year-old logging scars and branch stubs of various sizes.)

Hesterberg, Gene A.
1957. DETERIORATION OF SUGAR MAPLE FOLLOWING LOGGING DAMAGE. U.S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 51, 58 pp., illus. (Processed.) SP-51*
(Maples with 10- and 20-year-old logging scars were dissected to determine the amount of cull and degrade caused by the injury. The amount of defect was found to be related to the size of the wound and the length of time since wounding.)

Kessler, K. J., and Anderson, R. L.
1960. *CERATOCYSTIS COERULESCENS* ON SUGAR MAPLE IN THE LAKE STATES. Plant Dis. Rptr. 44: 348-350, illus. (Processed.) R-218*
(A fungus isolated from a declining hard maple in Michigan was identified as the hardwood form of *Ceratocystis coerulescens*. This is the first report of this pathogen in the Lake States region. At present there is no evidence that it is an important factor in the maple blight and maple dieback problems.)

King, D. B.
1958. INCIDENCE OF WHITE PINE BLISTER RUST INFECTION IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 64, 12 pp., illus. (Processed.) SP-64*
(A survey shows that in the low-hazard zone an average of 0.6 percent of the pines is lost in 5 years, whereas in the high-hazard zone the 5-year loss averages 6.3 percent. Data are presented showing the estimated proportion of present unprotected stands that will survive infection during a 100-year rotation by present age of stand and hazard zone.)

Skilling, D. D.
1959. MAPLE BLIGHT, A NEW FIGHT. Amer. Forests 65 (5): 20, 21, 53-55, illus. R-171*
(Describes the progress made on maple blight investigations since the blight was reported in 1957.)

Order No.

Thorne, Harry W., and Stone, Robert N.
1959. DEFECT IN WISCONSIN TIMBER. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 568, 2 pp., illus. (Processed.) TN-568*

(Defect as a percent of volume is shown for major species in Wisconsin.)

Van Arsdel, E. P.
1958. SMOKE MOVEMENT CLARIFIES SPREAD OF BLISTER RUST FROM RIBES TO DISTANT WHITE PINES. (Abs.) Bul. Amer. Met. Soc. 39 (8): 442-443. R-125

(Abstract of a paper presented at a national meeting. Discusses reasons for long-distance spread of rust spores from swamp Ribes to white pine.)

Van Arsdel, E. P.
1959. CLIMATIC RELATIONS OF WHITE PINE BLISTER RUST AND ITS CONTROL. In Research in Wisconsin, Wis. Conserv. Dept., pp. 56-57. (Processed.) R-172

(Summarizes progress on studies of the influence of climatic factors on blister rust prevalence and distribution.)

Van Arsdel, E. P.
1960. CYCLOHEXIMIDE (ACTI-DIONE), A NEW TOOL IN WHITE PINE BLISTER RUST CONTROL. Univ. Wis. Forestry Res. Note 54, 2 pp. (Processed.) R-219

(Summarizes present status of knowledge, indicating that this control method has proven effective on western white pine but that it is too early to evaluate its effectiveness on eastern white pine.)

Van Arsdel, E. P., and Nelson, Leiton E.
1959. BLISTER RUST SPREAD IS GENERAL IN NORTH, LOCAL IN SOUTH WISCONSIN DURING 1958. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 572, 2 pp. (Processed.) TN-572*

(Describes the pattern of rust development on Ribes and its spread to pine during 1958 as related to geographic location and weather conditions.)

Van Arsdel, E. P., Parmeter, J. R., and Riker, A. J.
1957. ELEVATION EFFECTS ON TEMPERATURE AND RAINFALL CORRELATED WITH BLISTER RUST DISTRIBUTION IN SOUTHWESTERN WISCONSIN. (Abs.) Phytopath. 47: 536. R-73

(In southwestern Wisconsin, blister rust prevalence was found to be associated with elevation as follows: Below 900 feet, practically absent; 900-1100 feet, largely limited to microclimatically cool sites; above 1100 feet, on most sites; and above 1200 feet, occasionally severe.)

Van Arsdel, E. P., and Riker, A. J.
1960. BLISTER RUST FUNGUS INOCULATIONS ON WHITE PINE IN MIST CHAMBERS. (Abs.). Phytopath. 50: 657. R-220

(Presents evidence that at least 48 hours of conditions favorable for infection are required before any appreciable amount of blister rust infection will occur on white pine.)

Van Arsdel, E. P., Tullis, E. C., and Panzer, J. D.
1958. MOVEMENT OF AIR IN A RICE PADDY AS INDICATED BY COLORED SMOKE. Plant Dis. Rptr. 42 (6): 721-725, illus. R-126

Order No.

(The release of colored smoke in a rice paddy demonstrated variations in air movement. Updrafts and downdrafts were produced during periods of sunlight over warmed and shaded areas. In still air at dawn a smoke drift of about 100 feet per minute was noted. It is suggested that a correlation may exist between local air movement and fungus spread.)

Watt, R. F.
1956. SEVERE WINTER DAMAGE TO CONIFERS NOTED IN PORTIONS OF NORTH DAKOTA, 1955-56. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 466, 2 pp. (Processed.) TN-466*

(Reports species damaged and type of injury to shelterbelts resulting from adverse climatic conditions.)

FOREST RECREATION

Taves, Marvin; Hathaway, William; and Bultena, Gordon.
1960. CANOE COUNTRY VACATIONERS. Univ. Minn. Agr. Expt. Sta. Misc. Rpt. 39, 28 pp., illus. R-230

(Describes the composition of a sample of recreationists in the Basswood Lake-Ely area of the Superior National Forest and their attitudes toward management and facilities.)

Taves, Marvin, and Morgan, James
1960. CANOE COUNTRY CAMPING--WHO, WHERE, WHY? Minn. Farm and Home Sci. 27 (3): 3, 20, illus. R-231

(Describes characteristics of a sample of 383 canoeists and campers in the Ely-Basswood Lake area of the Superior National Forest in 1958.)

FOREST WILDLIFE

Krefting, Laurits W., and Arend, John L.
1960. EFFECT OF DEER BROWSING ON A YOUNG JACK PINE PLANTATION IN NORTHERN LOWER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 586, 2 pp. (Processed.) TN-586*

(Excessive deer populations are capable of killing many young planted jack pine, retarding height growth up to one-half of its potential, and deforming trees so that they are of little value for timber products.)

McCulley, Robert D.
1959. MANAGEMENT FOR WOOD AND WILDLIFE. The Conserv. Volunteer 22 (130): 49-52, illus. R-173

(Relationship between the forest and wildlife is reviewed. Close correlation of timber and wildlife management is suggested.)

Stoeckeler, J. H., Keener, John M., and Strothmann, R. O.
1958. DEER BROWSE PRODUCTION FROM FELLED TREES IN THE NORTHERN HARDWOOD-HEMLOCK FOREST TYPE. Jour. Forestry 56: 416-421, illus. R-127*

(New growth of dormant hardwood tops was clipped and needles of hemlock were stripped to simulate winter browsing by deer after logging operations. The former yielded about 13 pounds and the latter 117 pounds of fresh browse per square foot of basal area of pole- and sawlog-size trees cut. The amount is two to three times higher in young 1- to 5-inch diameter hardwoods than in older stands.)

Order No.

Stoeckeler, J. H., and Scholz, H. F.
1956. A CYLINDRICAL SCREEN FOR PROTECTING DIRECT SEEDINGS OF FOREST TREE SPECIES. Jour. Forestry 54: 183-184, illus. R-23

(Several types of cylindrical screens to protect experimental direct seedings from rodents and birds are described. A special tool for setting the smaller screens is also discussed.)

Stoeckeler, J. H., Strothmann, R. O., and Krefting, L. W.
1957. EFFECT OF DEER BROWSING ON REPRODUCTION IN THE NORTHERN HARDWOOD-HEMLOCK TYPE IN NORTHEASTERN WISCONSIN. Jour. Wildlife Mangt. 21 (1): 75-80, illus. R-74*

(A period of 6 to 8 years of low deer population is needed in second-growth hardwood-hemlock stands to permit successful regeneration and the adequate growth of understory seedlings.)

SILVICS

Silvical Characteristics (brief summaries of knowledge concerning the distribution, habitat conditions, life history, special features, and genetic factors of several important forest tree species)

Godman, R. M.
1957. SILVICAL CHARACTERISTICS OF SUGAR MAPLE (*ACER SACCHARUM* MARSH.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 50, 24 pp., illus. (Processed.) SP-50*

Godman, R. M.
1958. SILVICAL CHARACTERISTICS OF NORTHERN WHITE-CEDAR (*THUJA OCCIDENTALIS* L.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 67, 17 pp., illus. (Processed.) SP-67*

Guilkey, Paul C.
1957. SILVICAL CHARACTERISTICS OF AMERICAN ELM (*ULMUS AMERICANA* L.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 54, 19 pp., illus. (Processed.) SP-54*

Heinselman, M. L.
1957. SILVICAL CHARACTERISTICS OF BLACK SPRUCE *PICEA MARIANA* (MILL.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 45, 30 pp., illus. (Processed.) SP-45*

Nienstaedt, Hans.
1958. SILVICAL CHARACTERISTICS OF WHITE SPRUCE (*PICEA GLAUCA* (MOENCH) VOSS). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 55, 23 pp., illus. (Processed.) SP-55*

Roe, Eugene I.
1957. SILVICAL CHARACTERISTICS OF TAMARACK (*LARIX LARICINA* (DUROI) K. KOCH). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 52, 22 pp., illus. (Processed.) SP-52*

Roe, Eugene I.
1958. SILVICAL CHARACTERISTICS OF BALSAM POPLAR (*POPULUS BALSAMIFERA* L.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 65, 17 pp., illus. (Processed.) SP-65*

	Order No.
Rudolf, Paul O. 1957. SILVICAL CHARACTERISTICS OF RED PINE (*PINUS RESINOSA* AIT.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 44, 32 pp., illus. (Processed.)	SP-44*
Rudolf, Paul O. 1958. SILVICAL CHARACTERISTICS OF JACK PINE (*PINUS BANKSIANA* LAMB.) U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 61, 31 pp., illus. (Processed.)	SP-61*
Scholz, Harold F. 1957. SILVICAL CHARACTERISTICS OF ROCK ELM (*ULMUS THOMASII* SARG.) U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 47, 16 pp., illus. (Processed.)	SP-47*
Scholz, Harold F. 1958. SILVICAL CHARACTERISTICS OF SLIPPERY ELM (*ULMUS RUBRA* MÜHL.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 59, 14 pp., illus. (Processed.)	SP-59*
Scholz, Harold F. 1958. SILVICAL CHARACTERISTICS OF AMERICAN BASSWOOD (*TILIA AMERICANA* L.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 62, 17 pp., illus. (Processed.)	SP-62*
Slabaugh, Paul E. 1958. SILVICAL CHARACTERISTICS OF BIGTOOTH ASPEN (*POPULUS GRANDIDENTATA* MICHX.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 63, 16 pp., illus. (Processed.)	SP-63*
Slabaugh, Paul E. 1958. SILVICAL CHARACTERISTICS OF BLACK MAPLE (*ACER NIGRUM* MICHX. f.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 66, 9 pp., illus. (Processed.)	SP-66*
Strothmann, R. O., and Zasada, Z. A. 1957. SILVICAL CHARACTERISTICS OF QUAKING ASPEN (*POPULUS TREMULOIDES* MICHX.). U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 49, 26 pp., illus. (Processed.)	SP-49*

Other Silvics Papers

Kozlowski, Theodore T., and Cooley, John H. 1960. NATURAL ROOT GRAFTING IN FOREST TREES. Univ. Wis. Forestry Res. Note 56, 1 p., (Processed.) (Excavation studies conducted at the Argonne Experimental Forest, Oneida County, Wis., showed root grafting between adjacent trees was fairly common for three of the conifers and four of the hardwoods occurring in this area.)	R-221

Order No.

ESTIMATION OF TIMBER VOLUME, GROWTH, AND YIELD

Site Index Curves (a series of Technical Notes, presenting site index curves for a number of tree species and explaining their use and limitations)

Cooley, John H.
1958. SITE INDEX CURVES FOR PAPER BIRCH IN NORTHERN WISCONSIN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 541, 2 pp., illus. (Processed.) TN-541*

Gevorkiantz, S. R.
1956. SITE INDEX CURVES FOR JACK PINE IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 463, 2 pp. illus. (Processed.) TN-463*

Gevorkiantz, S. R.
1956. SITE INDEX CURVES FOR ASPEN IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 464, 2 pp., illus. (Processed.) TN-464*

Gevorkiantz, S. R.
1956. SITE INDEX CURVES FOR BALSAM FIR IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 465, 2 pp., illus. (Processed.) TN-465*

Gevorkiantz, S. R.
1957. SITE INDEX CURVES FOR WHITE-CEDAR IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 472, 2 pp., illus. (Processed.) TN-472*

Gevorkiantz, S. R.
1957. SITE INDEX CURVES FOR BLACK SPRUCE IN THE LAKE STATES. U.S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 473, 2 pp., illus. (Processed.) TN-473*

Gevorkiantz, S. R.
1957. SITE INDEX CURVES FOR WHITE SPRUCE IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 474, 2 pp., illus. (Processed.) TN-474*

Gevorkiantz, S. R.
1957. SITE INDEX CURVES FOR WHITE PINE IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 483, 2 pp., illus. (Processed.) TN-483*

Gevorkiantz, S. R.
1957. SITE INDEX CURVES FOR RED PINE IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 484, 2 pp., illus. (Processed.) TN-484*

Gevorkiantz, S. R.
1957. SITE INDEX CURVES FOR RED OAK IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 485, 2 pp., illus. (Processed.) TN-485*

Order No.

Gevorkiantz, S. R.
1957. SITE INDEX CURVES FOR TAMARACK IN THE LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 498, 2 pp., illus. (Processed.) TN-498*

Other Papers on Timber Measurement

Avery, Gene, and Meyer, Merle P.
1959. VOLUME TABLES FOR AERIAL TIMBER ESTIMATING IN NORTHERN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 78, 21 pp., illus. (Processed.) SP-78*

(Analyzes the use in Minnesota of aerial volume tables from other regions, presents a preliminary table for northern Minnesota, and suggests a method for integrating photo estimates and field measurements of timber volume.)

Gevorkiantz, S. R.
1956. SHORT CUTS IN SCALING - CONVERTING STACKED CORDWOOD TO BOARD FEET. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 468, 1 p. (Processed.) TN-468*

(A method of converting cords to board feet, requiring only a direct count of 8-foot bolts.)

Hartong, A. L., and Thornton, P. L.
1956. BIAS IN TIMBER VOLUME ESTIMATES CAUSED BY ROUNDING OFF D.B.H. AND MERCHANTABLE LENGTH MEASUREMENTS. Jour. Forestry 54: 769-770. R-24*

(A study of 1,462 sample trees showed that grouping trees by 2-inch diameter classes and by half-log lengths caused overestimates of board-foot volume by 1.19 percent and 0.92 percent, respectively.)

Horn, Arthur G.
1957. TREE DIAMETER AT BREAST HEIGHT IN RELATION TO STUMP DIAMETER BY SPECIES GROUP. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 507, 2 pp. (Processed.) TN-507*

(A convenient table for converting tree stumps to d.b.h. by species groups; also a simple rule-of-thumb for making quick conversions.)

Stoeckeler, J. H., and Olsen, L. P.
1957. A REGRESSION EQUATION RELATING DIAMETER GROWTH RATE OF JACK PINE TO LIVE CROWN PERCENT. Jour. Forestry 55: 467, illus. R-75*

(In dense 26-year-old jack pine in central Wisconsin, trees with only 10 percent of their total height in live crown grew 0.07 inch in diameter in 5 years, at 20 percent 0.30 inch, at 30 percent 0.52 inch, and at 40 percent 0.68 inch. These observations have been useful as a guide in thinning young stands.)

TIMBER RESOURCE STATISTICS

County or Block Reports (the reports listed below are a continuation of a series showing forest area, timber volume, growth, timber cut, and allowable cut for each county or group of counties within each of the Lake States)

Michigan (most of the following reports are available from the Michigan Department of Conservation)

	Order No.
Chase, Clarence D., and Horn, A. G. 1956. TIMBER RESOURCES OF THE BALDWIN BLOCK, MICHIGAN. Mich. Dept. Conserv., 54 pp., illus. (Processed.)	R-25
Chase, Clarence D., and Horn, Arthur G. 1957. TIMBER RESOURCES, GOGEBIC AND ONTONAGON COUNTIES, MICHIGAN. Mich. Dept. Conserv., 46 pp., illus. (Processed.)	R-76
Essex, Burton L., Chase, Clarence D., Horn, Arthur G. 1959. TIMBER RESOURCES, SOUTHEASTERN BLOCK, LOWER PENINSULA, MICHIGAN. Mich. Dept. Conserv., 52 pp., illus. (Processed.)	R-174
Findell, Virgil E., Chase, Clarence D., and Horn, Arthur G. 1957. TIMBER RESOURCES OF THE MENOMINEE-GRAND MARAIS BLOCK, UPPER PENINSULA, MICHIGAN. Mich. Dept. Conserv., 74 pp., illus. (Processed.)	R-77
Findell, Virgil E., Chase, Clarence D., and Horn, Arthur G. 1957. TIMBER RESOURCES OF THE NEWBERRY-DRUMMOND ISLAND BLOCK, UPPER PENINSULA, MICHIGAN. Mich. Dept. Conserv., 57 pp. (Processed.)	R-78
Quinney, Dean N., Chase, Clarence D., and Horn, Arthur G. 1957. TIMBER RESOURCES, MIO BLOCK, LOWER PENINSULA, MICHIGAN. Mich. Dept. Conserv., 48 pp. (Processed.)	R-81
Quinney, Dean N., Chase, Clarence D., and Horn, Arthur G. 1958. TIMBER RESOURCES, NORTH TIP BLOCK, LOWER PENINSULA, MICHIGAN. Mich. Dept. Conserv., 88 pp., illus. (Processed.)	R-129
Rapp, Dennis A., Chase, Clarence D., and Horn, Arthur G. 1957. TIMBER RESOURCES, GLADWIN BLOCK, LOWER PENINSULA, MICHIGAN. Mich. Dept. Conserv., 49 pp., illus. (Processed.)	R-82

Minnesota (these reports were prepared by the Office of Iron Range Resources and Rehabilitation and Lake States Forest Experiment Station. Most of them are available from the Office of Iron Range Resources and Rehabilitation)

1956. THE FOREST RESOURCE OF COOK COUNTY, MINNESOTA. Office Iron Range Res. and Rehab., 61 pp., illus.	R-26
1957. THE FOREST RESOURCE OF SOUTHWESTERN MINNESOTA. Office Iron Range Res. and Rehab., 47 pp., illus.	R-79
1957. THE FOREST RESOURCE OF SOUTHEASTERN MINNESOTA. Office Iron Range Res. and Rehab., 60 pp., illus.	R-80

	Order No.
1958. THE FOREST RESOURCE OF CENTRAL MINNESOTA. Office Iron Range Res. and Rehab., 48 pp., illus.	R-128
Wisconsin (these reports were prepared by the Wisconsin Conservation Department and Lake States Forest Experiment Station. Most of them are available from the Wisconsin Conservation Department.)	
1956. FOREST RESOURCES OF CLARK COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 15, 37 pp., illus. (Processed.)	R-27
1956. FOREST RESOURCES OF MARATHON COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 16, 38 pp., illus. (Processed.)	R-28
1956. FOREST RESOURCES OF BURNETT COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 17, 37 pp., illus. (Processed.)	R-29
1956. FOREST RESOURCES OF WASHBURN COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 18, 38 pp., illus. (Processed.)	R-30
1956. FOREST RESOURCES OF DOUGLAS COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 19, 44 pp., illus. (Processed.)	R-31
1956. FOREST RESOURCES OF BAYFIELD COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 20, 37 pp., illus. (Processed.)	R-32
1956. FOREST RESOURCES OF SAWYER COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 21, 37 pp., illus. (Processed.)	R-33
1956. FOREST RESOURCES OF RUSK COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 22, 38 pp., illus. (Processed.)	R-34
1956. FOREST RESOURCES OF TAYLOR COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 23, 37 pp., illus. (Processed.)	R-35
1956. FOREST RESOURCES OF ASHLAND COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 24, 37 pp., illus. (Processed.)	R-36
1957. FOREST RESOURCES OF IRON COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 25, 37 pp., illus. (Processed.)	R-37
1957. FOREST RESOURCES OF SHAWANO COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 26, 37 pp., illus. (Processed.)	R-84
1957. FOREST RESOURCES OF LANGLADE COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 27, 37 pp., illus. (Processed.)	R-85
1957. FOREST RESOURCES OF FLORENCE COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 28, 31 pp., illus. (Processed.)	R-86
1957. FOREST RESOURCES OF MARINETTE COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 29, 37 pp., illus. (Processed.)	R-87
1957. FOREST RESOURCES OF OCONTO COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 30, 31 pp., illus. (Processed.)	R-130
1958. FOREST RESOURCES OF LINCOLN COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 31, 36 pp., illus. (Processed.)	R-131

Order No.

1958. FOREST RESOURCES OF PRICE COUNTY. Wis. Conserv. Dept., Forest Inventory Pub. 32, 31 pp., illus. (Processed.) R-132

1958. FOREST RESOURCES OF 32 NORTHERN AND CENTRAL WISCONSIN COUNTIES (STATISTICAL REPORT). Wis. Conserv. Dept., Forest Inventory Pub. 33, 25 pp. (Processed.) R-133

1958. FOREST RESOURCES OF TEN COUNTIES IN EAST CENTRAL WISCONSIN. Wis. Conserv. Dept., Forest Inventory Pub. 34, 48 pp., illus. (Processed.) R-134

1959. FOREST RESOURCES OF 13 COUNTIES IN SOUTHEASTERN WISCONSIN. Wis. Conserv. Dept., Forest Inventory Pub. 35, 54 pp., illus. (Processed.) R-175

1959. FOREST RESOURCES OF EIGHT COUNTIES IN WEST CENTRAL WISCONSIN. Wis. Conserv. Dept., Forest Inventory Pub. 36, 46 pp., illus. (Processed.) R-176

1959. FOREST RESOURCES OF EIGHT COUNTIES IN SOUTHWESTERN WISCONSIN. Wis. Conserv. Dept., Forest Inventory Pub. 37, 46 pp., illus. (Processed.) R-177

Other Timber Resource Reports

Cunningham, R. N.
1956. LAKE STATES TIMBER GROWTH INCREASING. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 452, 2 pp. (Processed.) TN-452*

(Compares growth in 1953 with 1936 and presents growth in board feet and cubic feet for each Lake State by species.)

Cunningham, R. N., Horn, A. G., and Quinney, D. N.
1958. MINNESOTA'S FOREST RESOURCES. U. S. Forest Serv., Forest Resource Rpt. 13, 52 pp., illus. FRR-13*

(Presents a resume of Minnesota's forest statistics, and points up problems confronting forest industry and land managers. Cutting could be increased 50 percent over 1953, but access roads and an active sales campaign are needed to stimulate cutting of overmature timber on public lands. Need for increased planting of softwoods is emphasized.)

Cunningham, R. N., and Survey Staff.
1956. LAKE STATES TIMBER RESOURCES. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 37, 31 pp. (Processed.) SP-37*

(Basic Timber Resource Review statistics for Mich., Wis., and Minn. are shown in 37 tables; no text except Foreword.)

Findell, V. E., and Pfeifer, R. E.
1958. FOREST AREA IN MICHIGAN COUNTIES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 545, 2 pp. (Processed.) TN-545*

(Presents total land area and commercial and noncommercial forest area by county.)

Findell, Virgil E., and Pfeifer, Ray E.
1959. COMMERCIAL FOREST LAND IN MICHIGAN BY FOREST TYPE AND COUNTY. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 547, 2 pp. (Processed.) TN-547*

(Lists the commercial forest area by type for each county.)

Order No.

Findell, Virgil E., and Pfeifer, Ray E.
1959. NET TIMBER VOLUME IN MICHIGAN BY SPECIES GROUP AND COUNTY. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 548, 2 pp. (Processed.) — TN-548*
(Presents net sawtimber and total volume by species or species group for each county.)

Findell, Virgil E., Pfeifer, Ray E., Horn, Arthur G., Tubbs, Carl H. — SP-82*
1960. MICHIGAN'S FOREST RESOURCES. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 82, 46 pp., illus.
(Reports the status of the forest resource as of 1954. Comparisons with the first survey made 20 years earlier show that timber growth has increased and young stands are more adequately stocked. Much more timber could be cut now from certain hardwood species, such as aspen, oak, paper birch, and soft maple, and from jack pine. Although the trend in total timber harvesting has been down in recent years, the trend of pulpwood cutting is up. About one-third of the timber products cut are exported to Wisconsin and other States.)

Ritter, L. B., and Cunningham, R. N.
1957. AN INVENTORY OF OUR FORESTS. Conserv. Volunteer 20 (118): 1-4, illus. — R-83
(Lists the major forest statistics for Minnesota as of 1953, taken from Station Papers 31 and 37, and briefly discusses trends.)

Stone, Robert N.
1958. FOREST PLANTING TRENDS IN NORTHERN LOWER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 539, 2 pp., illus. (Processed.) — TN-539*
(Presents forest plantings by ownership, species groups, and decades.)

Stone, Robert N.
1958. FOREST PLANTINGS IN NORTHERN LOWER MICHIGAN BY COUNTY. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 544, 2 pp., illus. (Processed.) — TN-544*
(Presents forest plantings by ownership, species group, and county for 1900 to 1956.)

Stone, Robert N.
1959. ESTABLISHED FOREST PLANTATIONS IN NORTHERN LOWER MICHIGAN, 1957. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 551, 2 pp., illus. (Processed.) — TN-551*
(Shows the area of established plantations in northern Lower Michigan by owner, type, stand-size class, and density.)

Stone, Robert N.
1960. PRELIMINARY REPORT ON THE SURVEY OF FOREST PLANTATIONS IN NORTHERN LOWER MICHIGAN. Mich. Acad. Sci., Arts, and Letters Papers (1959 meeting) 45: 93-102, illus. — R-223*
(Presents the major inventory information about plantations in northern Lower Michigan, including area, volume, and growth. Points out the impact of native tree overstories on plantation development.)

Order No.

Stone, Robert N., and Thorne, Harry W.
1959. FOREST AREA IN WISCONSIN COUNTIES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 554, 2 pp. (Processed.) — TN-554*
(Shows the area of commercial forest land and the proportion of land area occupied by forest in each county.)

Stone, Robert N., and Thorne, Harry W.
1959. TIMBER VOLUME IN WISCONSIN COUNTIES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 569, 2 pp. (Processed.) — TN-569*
(Shows timber volume by species and county.)

Thorne, Harry W., and Stone, Robert N.
1959. COMMERCIAL FOREST LAND IN WISCONSIN COUNTIES BY FOREST TYPE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 562, 2 pp. (Processed.) — TN-562*
(Shows commercial forest area by forest type and county.)

Vasilevsky, Alexander M.
1956. FOREST AREA IN MINNESOTA COUNTIES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 458, 2 pp. (Processed.) — TN-458*
(Presents total land area and commercial and noncommercial forest area by counties.)

Vasilevsky, Alexander M.
1956. COMMERCIAL FOREST LAND IN MINNESOTA COUNTIES BY FOREST TYPE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 470, 2 pp. (Processed.) — TN-470
(Forest area is shown by type for each county.)

Vasilevsky, Alexander M.
1958. NET TIMBER VOLUME BY SPECIES AND COUNTIES ON COMMERCIAL FOREST LAND IN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 522, 2 pp., illus. — TN-522*
(Presents net sawtimber volume and total net volume in cords by species and counties or county groups.)

Warner, John R., and Chase, Clarence D.
1956. THE TIMBER RESOURCE OF NORTH DAKOTA. U.S. Forest Serv., Lake States Forest Expt. Sta.,Sta. Paper 36, 39 pp., illus. (Processed.) — SP-36*
(Describes both native and planted forests of the state, emphasizing the native forest types. Areas, timber volumes, growth, and drain for native forests are presented.)

TIMBER PRODUCTS STATISTICS

Essex, Burton L.
1959. PRODUCTION OF MISCELLANEOUS TIMBER PRODUCTS--LAKE STATES, 1958. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 573, 2 pp. (Processed.) — TN-573*
(Reports the amount of timber cut for various products.)

Horn, A. G.
1956. LAKE STATES PULPWOOD PRODUCTION SHOWS INCREASE IN 1955, CANADIAN IMPORTS DECREASE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 456, 2 pp. (Processed.) — TN-456*
(Shows production by species in Minn., Wis., and Mich., as well as imports from other states and Canada. Also shows movement between states in the region. Tenth of an annual series.)

Order No.

Horn, A. G.
1956. SOME HIGHLIGHTS OF PULPWOOD PRODUCTION IN THE LAKE STATES, 1946-1955. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 457, 2 pp. (Processed.) TN-457*

(Shows pulpwood production by species in Minn., Wis., and Mich., for each year during 1946 to 1955; also averages by species and states.)

Horn, A. G.
1957. LAKE STATES PULPWOOD PRODUCTION REACHES NEW HIGH, 1956. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 495, 2 pp. (Processed.) TN-495*

(Shows production by species in Minn., Wis., and Mich.; also imports from other States and Canada, and movement between States in region.)

Horn, A. G.
1957. LAKE STATES VENEER LOG PRODUCTION AND IMPORTS SHOW SLIGHT INCREASE IN 1956. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 496, 2 pp., illus. (Processed.) TN-496*

(Shows production by species in Minn., Wis., and Mich., in 1956; also shows trend in production for each of the States from 1946 through 1956; and imports and movement of product between States.)

Horn, A. G.
1957. USE OF VENEER LOGS BY CONTAINER INDUSTRY ON DECLINE IN LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 497, 2 pp., illus. (Processed.) TN-497*

(Shows production by species in Minn., Wis., and Mich., in 1956; and trend in production for each of the Lake States from 1946 through 1956.)

Horn, A. G.
1957. PRODUCTION OF CHEMICAL AND CHARCOAL WOOD INCREASES IN THE LAKE STATES, 1956. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 505, 2 pp., illus. (Processed.) TN-505*

(Shows production by species in Minn., Mich., and Wis., in 1956 and trend of production for each of the States from 1946 through 1956.)

Horn, Arthur G.
1957. ANNUAL CUT OF EXCELSIOR BOLTS STARTS TO CLIMB, LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 506, 2 pp., illus. (Processed.) TN-506*

(Shows production by species in Minn., Wis., and Mich., in 1956; and trend of production for each of the States from 1946 through 1956.)

Horn, Arthur G.
1957. A RECORD OF THE TIMBER CUT FROM FORESTS OF THE LAKE STATES, 1954. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 53, 47 pp., illus. (Processed.) SP-53*

(Shows trends in timber cutting and production of forest products during the past few years by States, products, and species groups. For 1954 shows timber removed through cutting by product, species, and State.)

Order No.

Horn, A. G.
1958. LAKE STATES PULPWOOD PRODUCTION REMAINS HIGH--HARDWOOD CUT CLIMBS, 1957. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 529, 2 pp. (Processed.) TN-529*

(Shows pulpwood production and destination of wood by species in each of the three Lake States. Also shows imports from other states and Canada.)

Horn, A. G.
1958. TREND OF PULPWOOD HARVEST UP IN WISCONSIN, PARTICULARLY IN CENTRAL AREA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 531, 1 p., illus. (Processed.) TN-531*

(Compares the 1957 cut of Wisconsin pulpwood with that of 1948. Highlights the cuts by species and districts.)

Horn, A. G.
1959. LAKE STATES PULPWOOD PRODUCTION AND IMPORTS DECLINE IN 1958. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 558, 2 pp. (Processed.) TN-558*

(Shows pulpwood production and destination of wood by species in each of the three Lake States. Also shows imports from other states and Canada.)

Horn, Arthur G.
1958. WISCONSIN CHRISTMAS TREE HARVEST ESTIMATED AT NEARLY 1 1/3 MILLION TREES, 1957. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 553, 2 pp., illus. (Processed.) TN-553*

(Shows Christmas tree production by species and ownership class in each forest survey district.)

Horn, Arthur G.
1959. VENEER LOG PRODUCTION DECLINES SHARPLY IN LAKE STATES AS RESULT OF MILL CLOSURES, 1958. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 567, 2 pp. (Processed.) TN-567*

(Shows production by species in each of the Lake States and the imports from other States and Canada.)

Horn, A. G.
1959. MINE-TIMBER PRODUCTION DECLINES AS MORE SUBSTITUTES ARE USED AND LESS ORE IS MINED, LAKE STATES, 1958. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 570, 2 pp., illus. (Processed.) TN-570*

(Shows production by species in each of the Lake States and imports from other States and Canada.)

Horn, A. G.
1960. LAKE STATES PULPWOOD PRODUCTION EXCEEDS 3 MILLION CORDS, 1959. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 588, 2 pp. (Processed.) TN-588*

(Shows pulpwood production by species in Minn., Wis., and Mich., as well as imports by species from other States and Canada.)

Horn, Arthur G.
1960. PULPWOOD PRODUCTION IN LAKE STATES COUNTIES, 1959. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 85, 13 pp., illus. (Processed.) SP-85*

Order No.

(Compares pulpwood production and imports by States and species in 1959 with those of the previous year and 10 years ago. Shows 1959 production by species for the Forest Survey districts and counties in each of the three Lake States.)

Keller, Richard C.
1957. FUELWOOD AND FENCE POST PRODUCTION IN MINNESOTA BY COUNTIES, 1953-54 LOGGING SEASON. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 486, 2 pp. (Processed.) TN-486*

(Shows the production of fuelwood and fence posts by species and counties.)

FOREST ECONOMICS

Cunningham, R. N.
1956. FOREST OWNERSHIP STABILIZING IN LAKE STATES. U. S. Forest Serv., Lake States Forest Expt. Sta., Tech. Note 448, 2 pp. TN-448*

(A comparison of statistics on forest land ownership in 1931, 1940, 1945, and 1953 indicates a trend toward more stable ownership.)

Cunningham, R. N.
1957. NORTHERN HARDWOODS--A MAJOR TIMBER RESOURCE IN THE LAKE STATES AREA. The Timber Producer 13 (1): 1-2, illus. R-88

(Discusses in layman's terms the extent of the northern hardwood type in the Lake States, the sawtimber volume in its principal species, and the changes in distribution of stand-size classes between 1936 and 1953.)

Dickerman, M. B.
1956. TIMBER AS COLLATERAL. In Outlook on Minnesota's Resources (Report of the Governor's Statewide Conference on Resources, 1955), Iron Range Resources and Rehabilitation Comn., pp. 301-306. Also "Forests are Worth Money," Conserv. Volunteer 20 (114): 14-17. R-38

(Encouraging signs in the timber-supply situation are increased volume, increased stocking of young stands, stability of ownership, and better management of forest lands. Most unfavorable are the poor quality and the large area of nonproductive and poorly stocked forest land. Timber use needs to be increased, especially in aspen and low-grade hardwoods. Diseases and insects are greatest risk to timber supply.)

Guilkey, Paul C.
1957. THE HARDWOOD RESOURCES IN LOWER MICHIGAN, AND CURRENT AND POTENTIAL USES. Forest Prod. Jour. 7 (11): 23A-25A, illus. R-89*

(Survey of hardwood area, volume, quality, growth, and cut shows need for fuller utilization of low-quality hardwood timber to halt the decline of hardwood sawtimber quality. Forecasts increased demand for traditional products using high-grade timber, and rapid expansion into new products using fiber, particles, and short cuttings from low-grade timber.)

Lundgren, Allen L.
1959. COSTS OF MARKING BLACK SPRUCE FOR CUTTING IN NORTHERN MINNESOTA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 546, 2 pp. (Processed.) TN-546*

Order No.

(Marking costs per cord of black spruce were almost twice as much under the shelterwood system and nearly five times as much under the light selection cut system where individual trees were marked, as under the clearcut system where area boundaries were designated.)

Morgan, James T.

1956. CENTRAL WISCONSIN FOREST LANDS MOSTLY PRIVATELY OWNED. U.S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 451, 2 pp. (Processed.) TN-451*

(Gives forest area by ownership class for a group of 13 central Wisconsin counties. Shows percentage of area in each stand-size class held by each ownership group.)

Morgan, James T.

1960. THE BUSINESS OF COUNTING TREES. Conserv. Volunteer 23 (134): 38-42, illus. R-222*

(Discusses the need for periodic statewide timber inventories and the uses of the results. Describes the line-plot and block-mapping methods used in the first and second Lake States surveys, and the proportional-sampling-with-permanent-plots method being used in the third Minnesota survey.)

Morgan, J. T., and Dickerman, M. B.

1957. COMMENTS ON THE TIMBER RESOURCE OF NORTHERN LOWER MICHIGAN. U. S. Forest Serv., Lake States Forest Expt. Sta., 6 pp. (Mimeo.) (Presented at annual meeting of Wis.-Mich. Section Soc. Amer. Foresters, Sept. 19, 1957.) R-90

(Summarizes changes in the timber resource since the thirties: more forest land, an improvement in stocking in all size-classes of aspen type, an increase in softwood types largely due to planting of red pine, and an increase in the oak area; a rise in sawlog material, and cordwood volume nearly double; and a threefold increase in pulpwood consumption.)

Morgan, James T., and Dickerman, M. B.

1960. RETURN OF THE FOREST. Mich. Conserv. 29 (1): 18-21, illus. R-224

(Discusses in general terms the changes in forest conditions in northern Lower Michigan between 1936 and 1956, based on two Forest Surveys. Timber stocking has improved and timber volumes have increased in most species. Pulpwood use has increased rapidly.)

Stoeckeler, J. H., Trenk, F. B., and Strothman /Strothmann7, R. O.

1959. TIMBER GROWTH AND LABOR OPPORTUNITIES FOR SUSTAINED HARVEST CUTS--ARGONNE TIMBER HARVEST FOREST. Univ. Wis. Forestry Research Note 46, 2 pp. (Processed.) R-178*

(Annual harvest cuts approximating the annual growth were made for 8 successive years on a northern hardwoods farm forestry forty. During this period 42.9 MBM of sawlogs, 33.8 cords of softwood pulpwood, and 125.8 cords of hardwood fuelwood were harvested. Total labor expended was 1,196 man-hours.)

Stoeckeler, J. H., Trenk, F. B., and Strathman /Strothmann7, R. O.

1959. WAGE INCOME FROM IMPROVEMENT HARVEST CUTS--ARGONNE TIMBER HARVEST FOREST. Univ. Wis. Forestry Research Note 47, 2 pp., (Processed.) R-179*

Order No.

(Annual harvest cuts approximating the annual growth were made for 8 successive years on a northern hardwoods farm forestry forty. The net income per year was $248, or an average of $1.66 per man-hour of labor. This compares favorably with the per-hour returns from regular farm work.)

Sutherland, Charles F., and Tubbs, Carl.
1959. INFLUENCE OF OWNERSHIP ON FORESTRY IN SMALL WOODLANDS IN CENTRAL WISCONSIN. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 77, 21 pp., illus. (Processed.) SP-77*

(Describes characteristics of owners of small woodlands, objectives of forest land use, and reasons owners gave for taking part or not taking part in forestry programs. Characteristics which most often indicated relationship with owner objectives and practices were occupation, size of forest tract, and age.)

Sutherland, Charles F., Jr., and Williams, Ellis T.
1960. SOME ASPECTS OF FOREST TAXATION UNDER THE FOREST CROP LAW AND UNDER THE GENERAL PROPERTY TAX IN WISCONSIN. Land Econ. 36: 65-78. R-225*

(A study of forest taxation in northeastern and central Wisconsin in 1958 revealed that (1) in most cases the accumulated taxes under the Forest Crop Law at the end of the contract period would account for an excessive share of the expected net income from forest products, (2) forest land is assessed at a higher ratio of its full market value than is other land (confirming the results of earlier studies), (3) distance of the owner's residence from the tract had no significant effect on assessment, and (4) size and value of timber strongly affect assessment.)

Toole, Arlie W.
1960. OPPORTUNITY FOR NEW WOOD INDUSTRIES: THE LAKE STATES FOREST RESOURCE. Forest Prod. Jour. 10: 51-54, illus. R-226*

(The Lake States area has over 53 million forested acres. The increment rate is 1,200 million cubic feet annually; less than half is used. Intensive forest management and forest utilization would provide the base for a multi-billion-dollar industry.)

Vasilevsky, Alexander M.
1957. OWNERSHIP OF COMMERCIAL FOREST LAND IN MINNESOTA COUNTIES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 475, 2 pp., illus. (Processed.) TN-475*

(Shows distribution of commercial forest land by county and ownership group.)

Yoho, James G., James, Lee M., and Quinney, Dean N.
1957. PRIVATE FOREST LANDOWNERSHIP AND MANAGEMENT IN THE NORTHERN HALF OF MICHIGAN'S LOWER PENINSULA. Mich. State Univ. Agr. Expt. Sta. Tech. Bul. 261, 56 pp., illus. R-91*

(Private landowners own 65 percent of the commercial forest land in the northern half of Lower Michigan. Of these, 30 percent are farmers or parttime farmers, while the rest are a diverse occupation group, most of whom do not reside full time on the forest property. Characteristics of ownership such as distance of residence from forest land, length of tenure, and age of owners, were found to be related to timber management.)

Order No.

TIMBER UTILIZATION AND MARKETING

Charcoal

Boldt, Charles E., and Arbogast, Carl, Jr.
1960. CHARCOAL KILN OPERATION FOR IMPROVED TIMBER STANDS. Forest Prod. Jour. 10: 42-44, illus. R-227*

(By converting the low-value wood removed in thinning a northern hardwood second-growth stand to a higher value product, such as charcoal, the timber stand improvement operation may be carried out more economically. The relationship between labor and wood costs and the selling price of charcoal for the operation to break even is shown in a chart.)

Lane, Paul H.
1957. DESIGN OF A CINDER-CONCRETE BLOCK CHARCOAL KILN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 494, 2 pp., illus. (Processed.) TN-494*

(Describes and presents schematic drawing of an experimental composite-wall, 3-cord charcoal kiln costing about $350 for materials. This design is intended to prevent air leakage, thus providing better control during carbonization and a shorter cooling cycle.)

Lane, Paul H.
1960. WOOD CARBONIZATION IN KILNS. Forest Prod. Jour. 10: 344-348, illus. R-228*

(A study of the design and carbonization process for three small, rectangular kilns -- sheet metal, castable refractory, and cinder-concrete block -- showed that good-quality charcoal can be produced consistently in the first two types of kilns.)

Lane, Paul H., and Boldt, Charles E.
1957. THE CHARCOAL RESEARCH PROGRAM OF THE LAKE STATES FOREST EXPERIMENT STATION. The Timber Producer 13 (5): 16-17, illus. R-94*

(Discusses the objectives of the Station's research program on the production of charcoal in kilns and gives some of the results.)

Lane, Paul H., and Sprenger, Gerald E.
1956. DESIGN OF AN EXPERIMENTAL SHEET METAL CHARCOAL KILN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 471, 2 pp., illus. (Processed.) TN-471*

(Describes and presents schematic drawing of an experimental 3-cord charcoal kiln with a composite wall of sheet metal, insulation, and sand. Cost of materials for the kiln is about $450.)

Ward, James C.
1959. THE EFFECT OF TIME AND CARBONIZING TEMPERATURES ON QUALITY OF CHARCOAL FROM A CINDER-CONCRETE BLOCK KILN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 557, 2 pp., illus. (Processed.) TN-557*

(Volatile content of charcoal produced in small cinder-concrete block kilns increases from top to bottom of the charge; however, the composition of the total kiln yield is within the requirements for good-quality domestic-grade charcoal.)

Order No.

Ward, James C.
1959. AIR SEASONING OF WOOD REDUCES CHARCOAL PRODUCTION TIME. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 566, 2 pp., illus. (Processed.) TN-566*

(The results of six experimental burns in a small charcoal kiln showed that carbonization time for air-seasoned wood was about 40 percent less than for green wood.)

Ward, James C., and Lane, Paul H.
1960. WATER SPRAYS WILL SHORTEN CHARCOAL COOLING TIME. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 582, 2 pp., illus. (Processed.) TN-582*

(Showed that 650 gallons of water sprayed intermittently on top of 2,100 pounds of charcoal for 4 hours lowered kiln temperatures from 900° F. to 200° F., allowing kilns to be opened in 13 hours as compared to 60 hours by natural radiation.)

Warner, John R.
1957. HOW LARGE IS THE CHARCOAL MARKET? U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 477, 2 pp., illus. (Processed.) TN-477

(A brief description of the market for domestic charcoal in Wausau, Wis., in 1955.)

Warner, John R., and Essex, Burton L.
1960. TRENDS IN THE WISCONSIN CHARCOAL MARKET. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 80, 22 pp., illus. (Processed.) SP-80*

(Describes the increase in domestic charcoal sales by type of retail store and size of city. Briquetted charcoal is preferred over lump charcoal and the 10-pound package far outsold all other sizes.)

Warner, John R., and Lord, William B.
1957. THE MARKET FOR DOMESTIC CHARCOAL IN WISCONSIN. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 46, 15 pp., illus. (Processed.) SP-46*

(Discusses the size of the market for bagged charcoal in Wisconsin in 1955 and describes marketing activities. Annual sales, although highly seasonal, are rising rapidly. Grocery stores are replacing fuel dealers as retail outlets.)

Wood Pallets

Warner, John R.
1956. WOOD PALLET IMPORTS IN MINNEAPOLIS-ST. PAUL AREA, 1954. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 461, 1 p., illus. (Processed.) TN-461*

(Presents pallet volume by size of pallet, species of wood used in manufacture, and state origin.)

Warner, John R.
1956. SMALL LOCAL MANUFACTURERS SUPPLY LARGE SHARE OF WOOD PALLETS USED IN MINNEAPOLIS-ST. PAUL AREA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 467, 2 pp. (Processed.) TN-467*

Order No.

(Compares the relative importance of small and large manufacturers in the regional pallet industry with respect to supply of Twin Cities demand.)

Warner, John R.
1957. DISTRIBUTION CHANNELS USED BY WOOD PALLET MANUFACTURERS SELLING IN THE MINNEAPOLIS-ST. PAUL AREA. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 478, 1 p., illus. (Processed.) TN-478*

(Shows lines of sales efforts for 19 pallet manufacturers supplying Twin Cities industries.)

Warner, John R., and Cowan, D. Ross.
1956. WOOD PALLETS IN THE MINNEAPOLIS-ST. PAUL AREA: AN OUTLET FOR LOW-GRADE HARDWOODS. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 43, 34 pp., illus. (Processed.) SP-43*

(Describes the market for wood pallets provided by the Twin Cities metropolitan area with emphasis on use and procurement.)

Wood Use by Twin Cities Industries (The first eight items listed below describe the volume, species, form, source, and use of lumber purchased in 1956 by various industries in Minneapolis and St. Paul. The last item presents the final report on the study, and gives considerably more detail.)

Warner, J. R.
1957. THE TWIN CITIES TRANSPORTATION EQUIPMENT INDUSTRY AS A USER OF WOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 493, 1 p. (Processed.) TN-493*

Warner, John R.
1957. THE TWIN CITIES PRIMARY METAL INDUSTRIES AS USERS OF WOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 499, 2 pp., illus. (Processed.) TN-499*

Warner, John R.
1957. THE TWIN CITIES FABRICATED METAL PRODUCTS INDUSTRIES AS USERS OF WOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 500, 2 pp., illus. (Processed.) TN-500*

Warner, John R.
1957. THE TWIN CITIES ELECTRICAL MACHINERY INDUSTRIES AS USERS OF WOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 513, 2 pp., illus. (Processed.) TN-513*

Warner, John R.
1957. THE TWIN CITIES NONELECTRICAL MACHINERY INDUSTRIES AS USERS OF WOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 514, 2 pp., illus. (Processed.) TN-514

Warner, John R.
1958. THE TWIN CITIES LUMBER AND WOOD PRODUCTS INDUSTRIES AS USERS OF WOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 517, 2 pp., illus. (Processed.) TN-517*

Order No.

Warner, John R.
1958. MISCELLANEOUS MANUFACTURING INDUSTRIES IN THE TWIN CITIES AS USERS OF WOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 518, 2 pp., illus. (Processed.) TN-518*

Warner, John R.
1958. LUMBER PURCHASES BY SEVEN MANUFACTURING INDUSTRY GROUPS IN MINNEAPOLIS AND ST. PAUL, 1956. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 534, 2 pp., illus. (Processed.) TN-534*

Warner, John R., and Tubbs, Carl H.
1959. WOOD USE BY MANUFACTURING FIRMS IN MINNEAPOLIS AND ST. PAUL. U. S. Forest Serv., Lake States Forest Expt. Sta., Sta. Paper 75, 30 pp., illus. (Processed.) SP-75*

Other Utilization and Marketing Reports

Benzie, John W.
1959. SMALL TRACTORS, GROUND SKIDDING REDUCE TREE DAMAGE IN SELECTION HARVEST. The Timberman 60 (11): 42, 43, 54, illus. R-180*

(Cutting an old-growth northern hardwood stand from 132 square feet of basal area to 70 square feet per acre in trees 10 inches d.b.h. and larger caused felling injuries on 5 percent of the residual trees. Skidding injuries were smaller and fewer where small equipment was used.)

Boldt, Charles E.
1958. KILN CORDWOOD CAN BE SEASONED RAPIDLY BY TRANSPIRATION. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 530, 2 pp., illus. (Processed.) TN-530*

(Felling sugar maple trees in August and not bucking them until their leaves withered and dried (about 25 days) resulted in a moisture content 13 percent lower than could be obtained by the usual bucking immediately after felling and air drying for the same period.)

Boldt, C. E., and Salminen, W. A.
1956. PERMANENT LOGGING ROADS FACILITATE ECONOMICAL TIMBER SALVAGE. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 450, 1 p. (Processed.) TN-450*

(Gives details, including areas, volumes, stumpage receipts, and mileage of access roads utilized, for seven separate salvage sales made on the Upper Peninsula Experimental Forest following tornado damage. The value of a permanent system of logging roads is emphasized by the comparatively high stumpage prices paid for windthrown timber spread thinly over large areas.)

Conover, David F.
1956. HARVESTING CHEMICAL WOOD AND PULPWOOD MORE THAN DOUBLES USUAL YIELDS FROM IMPROVEMENT CUTTING IN SECOND-GROWTH NORTHERN HARDWOODS. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 459, 2 pp. (Processed.) TN-459*

(In a case history study of a logging operation where hardwood pulpwood and chemical wood were harvested along with sawlogs and tie cuts, yields were increased and value to residual stand enhanced.)

Order No.

Dickerman, M. B.
1957. FOREST RESEARCH AIDS BETTER TIMBER UTILIZATION. Amer. Forests 63 (11): 20, 21, 56, 57, illus. — R-92*

(The Station and cooperating agencies are giving increasing attention on how to improve growth and assure fullest use of the timber resource. Some of the research in this field include studies on: Reforestation to ensure successful plantations of the better species; genetics to improve quality and pest resistance of trees; insect, disease, and fire control methods to protect existing stands; thinning to ensure larger and better quality trees; cutting methods to favor natural reproduction of the valuable species; markets for low-quality material that should be removed; logging methods that will not damage residual trees.)

Guilkey, Paul C., and Blair, Rowland W.
1956. COSTS OF CHEMICAL DEBARKING OF OAK IN LOWER MICHIGAN. U.S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 445, 2 pp. (Processed.) — TN-445*

(Both northern pin oak and white oak were treated with 40-percent sodium arsenite for chemical debarking. The total costs per cord vary more by merchantable length than by species. Chemical debarking of scrub oak costs about $1.75 per cord when chemical cost is $2.11 per gallon and labor costs $1.40 per hour.)

Guilkey, Paul C.
1956. SHORT BOLTS OFFER BETTER HARDWOOD UTILIZATION. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 446, 2 pp. (Processed.) — TN-446*

(Log scale was increased one-fourth by cutting 52-inch bolts instead of standard logs. The gain came from short clear sections of the trees that were too short for standard logs. The gain is greatest in small trees (12-inch d.b.h.) and drops off rapidly, with 18-inch trees showing no gain.)

Horn, Arthur G.
1957. THE MODERN FOREST INDUSTRY. Conserv. Volunteer 20 (117): 45-51, illus. Also in Timber Prod. Assoc. Monthly Bul. 12 (10:) 8-11. — R-93

(Discusses importance of second-growth timber. Shows number of primary wood-using plants and the quantity of rough forest products harvested annually in different sections of the State. Suggests increased use of some timber species.)

Lane, Paul H., and Scheffer, Theodore C.
1960. WATER SPRAYS PROTECT HARDWOOD LOGS FROM STAIN AND DECAY. Forest Prod. Jour. 10: 277-282, illus. — R-229*

(Winter-cut birch and maple logs deck-stored in central Wisconsin under water sprays from April to October showed no decay or fungus stain. In unsprayed logs, rot penetrated into the ends of the logs an average of 8 inches, and stain an average of 30 inches.)

Lohrey, Richard E.
1959. DEBARKING BIGTOOTH ASPEN WITH 2,4-D AMINE SALT. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 550, 2 pp. (Processed.) — TN-550*

Order No.

(Undiluted (4 pounds acid per gallon) or a 50-percent concentration of 2,4-D amine applied in frills was nearly as effective a bark-loosening agent as sodium arsenite. Lesser concentrations of 2,4-D gave poor results and were inferior to bark applications of 2,4,5-T ester.)

Marden, R. M., and Conover, D. F.
1959. DIAGRAMING TECHNIQUES FOR DESCRIBING TREE STEMS AND CROWNS. Jour. Forestry 57: 173-175, illus. R-181*
(Describes stem and crown diagraming techniques used to measure the effects of various cutting intensities on quality development of young northern hardwoods. The information will be useful in the development of marking guides for the management of young stands.)

Neetzel, John R., and Christopherson, C. H.
1958. FENCE POSTS FROM TREE FARMS. Keep Minn. Green 3 (3): 7, 10. R-135
(Many farmers cut fence posts from their woodlots and tree farms. If the posts are to be used untreated, naturally durable species like black locust or white or bur oak should be used. If the home-cut posts are to be treated, species that will take treatment readily (jack and red pines and red oak) should be selected.)

Neetzel, John R., Hossfeld, Ralph L., and Otis, C. K.
1956. SMALL TREATING TANK FOR ON-THE-FARM APPLICATIONS OF WOOD PRESERVATIVES. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 454, 2 pp., illus. (Processed.) TN-454*
(Presents drawings and specifications for an inexpensive, small, on-the-farm, coldsoaking treating tank. This tank will handle lumber up to 12 inches wide, 8 inches thick, and 16 feet long. The cover also serves as a drain board.)

Neetzel, John R., and Kite, G. D.
1959. ANSWERS TO YOUR FENCING PROBLEMS. Farm. Quarterly 14 (1): 64-67, 100+, illus. R-182
(This article deals largely with new ideas in fence design and construction, with special emphasis on the mechanization of farm fencing through power driving of wood posts.)

Neetzel, John R., and Otis, C. K.
1959. ROSEMOUNT EXPERIMENT STATION TRIES NEW IDEAS IN ANIMAL SHELTER BUILDINGS. Farm and Home Sci. XVI (2): 20-21, illus. R-183
(Describes some of the principal features of a pole-type hog farrowing house, hog feeding buildings, and a large structure for research with turkeys. Some new ideas in insulated and ventilated pole buildings are discussed.)

Office of Iron Range Resources and Rehabilitation and Lake States Forest Experiment Station.
1956. MINNESOTA DIRECTORY, PRIMARY WOOD-USING INDUSTRIES. Office of Iron Range Res. and Rehab., 113 pp., illus. R-39
(Presents a classified listing of all known primary wood-using industries in Minnesota by county, giving company name and address. A description of the sawmills as well as their market is also given.)

Order No.

Ralston, R. A.
1956. THE BREAK-EVEN POINT FOR ROUGH 8-FOOT BOLTS MERCHANTABLE AS SAWLOGS OR CORDWOOD. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 469, 2 pp. (Processed.) TN-469*

(A table shows break-even diameters for small rough forest products salable as cordwood or sawlogs under the Doyle, Scribner Dec. C., and International ¼-inch rules.)

Salzman, J. A., Sullivan, E. T., Neetzel, J. R., and Shiue, C. J.
1958. THE WATER-HOLDING CAPACITY OF WOOD CHIPS AS COMPARED WITH COMMON LIVESTOCK BEDDING. Univ. Minn. Forestry Note 69, 2 pp. (Processed.) R-136

(This study compared the water-holding capacity of wood chips, which have had limited use for livestock and poultry bedding, with that of straw and other bedding materials. Chips were somewhat inferior to straw but compared favorably with most bedding materials.)

Stone, Robert N., and Chase, Clarence D.
1959. SAWTIMBER LOG GRADES IN WISCONSIN. U. S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 563, 2 pp. (Processed.) TN-563*

(Presents log grade distribution for several major Wisconsin species as determined by field study.)

Sullivan, E. T., Neetzel, J. R., and Salzman, J. A.
1958. WOOD CHIP LIVESTOCK BEDDING--AN OUTLET FOR LOW-QUALITY FARM TIMBER? Minn. Farm and Home Sci. 16 (1): 7, 9, 17. R-137

(While wood chips, pound for pound, do not absorb as much water as straw or shredded cornstalk, they do compare favorably with sawdust, shavings, and ground corn cobs, and could in the future provide an outlet for low-quality wood now so abundant in farm woodlots.)

AUTHOR INDEX

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